St. Botolph's
Church of England Primary School

Mathematics Calculation Policy
September 2022

This policy contains the key written methods of calculation that are to be taught throughout the school. It has been written to ensure consistency and progression throughout the school. Although the main focus of this policy is on formal written methods it is important to recognise that the ability to calculate mentally lies at the heart of mathematics as in every written method there is an element of mental processing.

The overall aim is that when children leave primary school they:

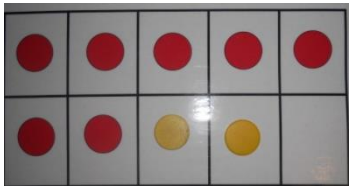
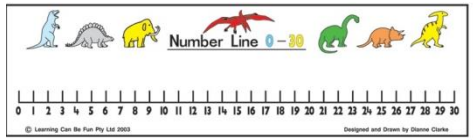
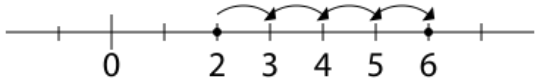
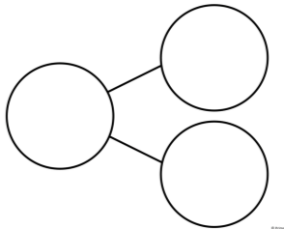
- have a secure knowledge of number facts and a good understanding of the four operations;
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads; and
- have an efficient, reliable, formal, written method of calculation for each operation that they can apply with confidence when undertaking calculations that they cannot carry out mentally.

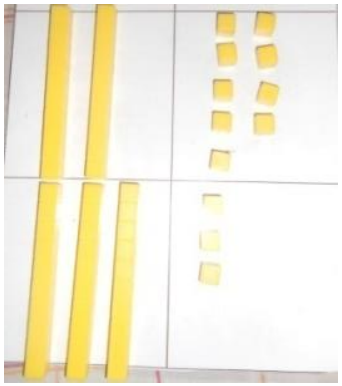
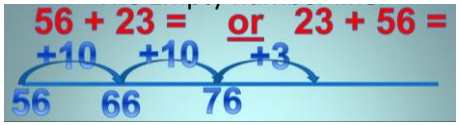
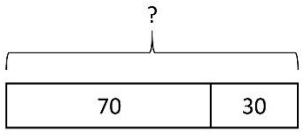
They can select the method by asking themselves:
'Can I do this in my head?', 'Can I do this in my head using drawings or jottings?' or 'Do I need to use a written method?'

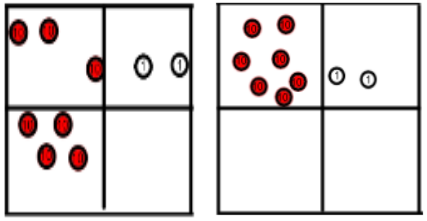
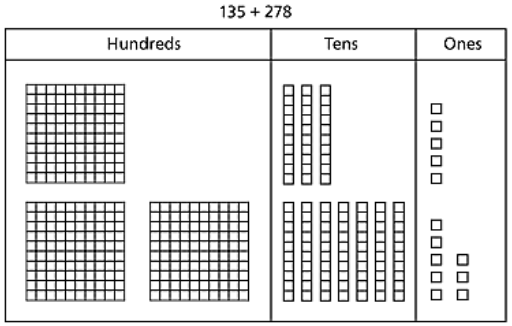
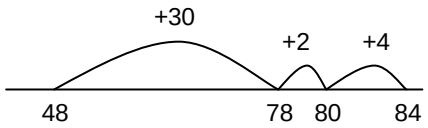
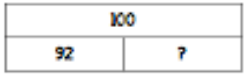
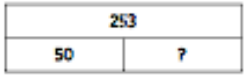
Although each method will be taught in the year group specified, children are encouraged to use previously taught methods also as this ensures that they: utilise those with which they are secure while the new concepts are becoming embedded; and build towards knowing which method is most efficient for each mathematical challenge that they face. Examples of the formal written methods for each of the four operations have been outlined alongside the objective from the National Curriculum Programme of Study 2014.

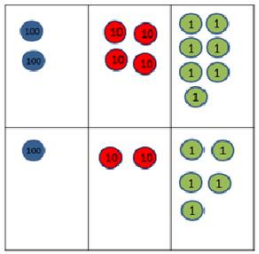
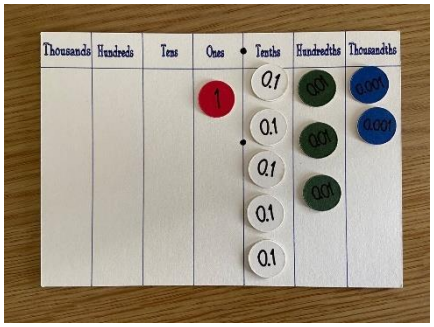
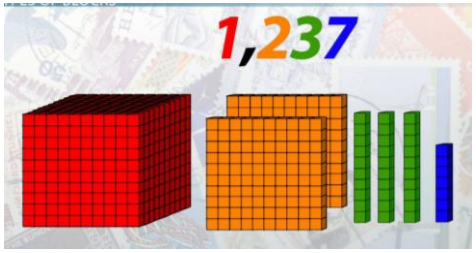
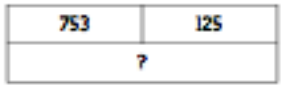
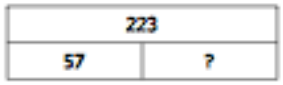
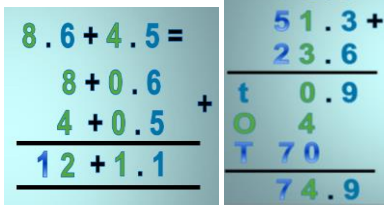
These written methods are available on an animated PowerPoint to be used as a teaching resource during lessons (‘Progression of Calculation Methods’).

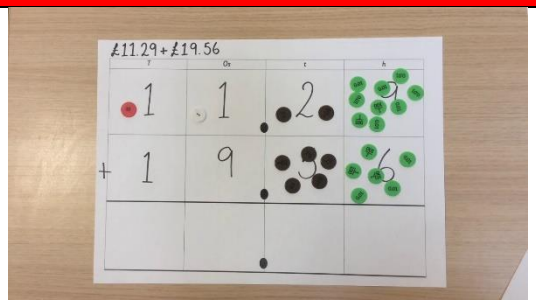
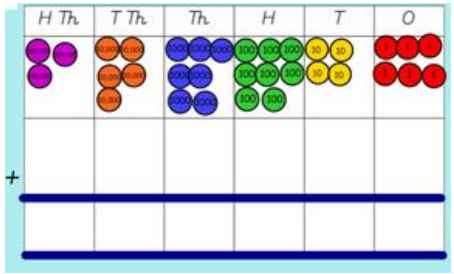
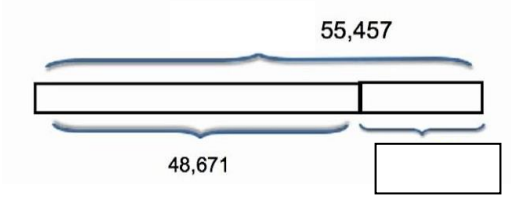
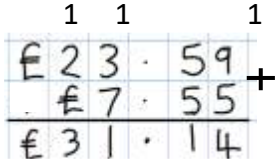
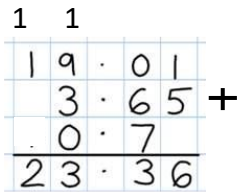
Addition

Year 1:	Read, write and interpret mathematical statements involving addition and the equals sign. Solve one-step problems that involve addition using concrete objects and pictorial representation and missing number problems. Add one-digit and two-digit numbers to 20, including zero		
Mental	**Concrete**	**Pictorial**	**Abstract**
1. Recall all number bonds of single digit numbers. 2. Recall all number bonds to 10 (in any order). 3. Count in multiples of 2 (starting from 0). 4. Recall one more than a given number up to 10. 5. Recall all number bonds to 20 (in any order). 6. Recall one more than up to 20. 7. Work out the corresponding subtraction facts. 8. Use known facts to work out unknown facts, e.g. *7 + 2 =9 to work out 27 + 2, 37 + 2* 9. Work out the corresponding subtraction facts.		Numbered Number Line  **AND** Empty Number Line  **AND** Part Whole 	2 + 4 = 6

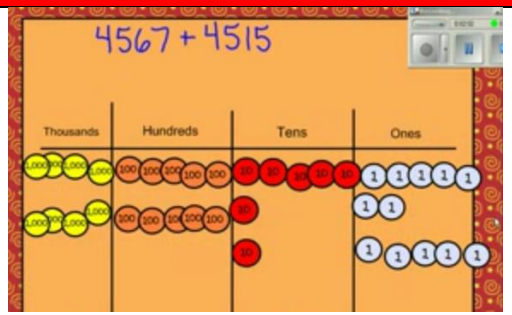
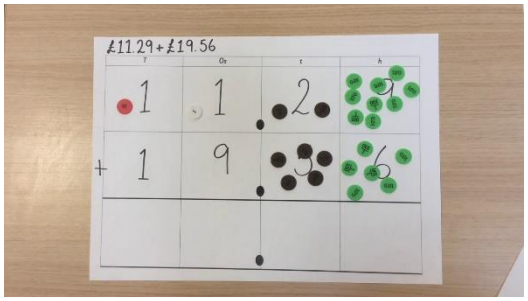
Year 2:	Recognise the place value of each digit in a two-digit number (tens, ones), Add numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones TO + O; a two-digit number and tens TO + T; two two-digit numbers TO +TO; adding three one-digit numbers O + O + O. Show that addition of two numbers can be done in any order (commutative). Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Recall all number bonds to 20 fluently (addition). 2. Recall all number bonds to 100 (adding multiples of 10). 3. Recall combinations of pairs of numbers, i.e. 5 = 0 + 5 = 1 + 4 = 2 + 3 = 3 + 2 = 4 + 1 = 5 + 0 4. Add 9 to single digit numbers by adding 10, subtracting 1. 5. Recall ten more than any given number (up to 100), i.e. 37, 28 etc. 6. Add a 1-digit number to a 1 or 2-digit number using number facts ('make ten'/bridging multiples of 10).		Empty Number Line  Understanding commutativity Using number bonds to support mental maths **AND** Bar Model/Part Whole  70 + 30 = 100	Partitioning 25 + 36 = 61 25 + 30 = 55 55 + 6 = 61 OR 20 + 30 = 50 5 + 6 = 11 50 + 11 = 61 **AND** Expanded Column 42 + 35 = 77 40 + 2 + 30 + 5 70 + 7

Year 3:	Add numbers **with up to three digits**, using the formal written methods of columnar addition. Estimate the answer to a calculation and use inverse operations to check answers. Solve missing number problems, using number facts, place value and complex addition.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know pairs with each total to 20 e.g. *2 + 6 = 8, 12 + 6 = 18, 7 + 8 = 15*. 2. Add any two 2-digit numbers by counting on in 10s and 1s or by using partitioning. 3. Add multiples and near multiples of 10 and 100. 4. Calculate 100 more than any given number (up to 1,000). 5. Perform place value additions with ease e.g. *300 + 8 + 50 = 358.* 6. Use place value and number facts to add a 1 digit or 2 digit number to a 3 digit number, e.g. *104 + 56 is 160 since 104 + 50 = 154 and 6 + 4 = 10 AND 676 + 8 is 684 since 8 = 4 + 4 and 76 + 4 + 4 = 84.* 7. Add pairs of 'friendly' 3-digit numbers e.g. *320 + 450.*	Move all the ones together and EXCHANGE ten ones for a ten counter.   	Empty Number Line Children need to be secure adding multiples of 10 to any two-digit number including those that are not multiples of 10. 48 + 36 = 84  **AND** Bar Model/Part Whole   	Partitioning 125 + 36 = 161 125 + 30 = 155 155 + 6 = 161 OR 120 + 30 = 150 5 + 6 = 11 150 + 11 = 161 **AND** Expanded Column 442 + 335 = 777 400 + 40 + 2 300 + 30 + 5 + 700 + 70 + 7 872 + 541 = 1413 800 + 70 + 2 500 + 40 + 1 + 1,300 + 110 + 3 ***Short column can be taught when expanded is secure, later in the year.***

Year 4:	Add numbers **with up to 4 digits** using the formal written methods of columnar addition where appropriate. Estimate and use inverse operations to check answers to a calculation. Solve addition two-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Add any two 2-digit numbers by partitioning or counting on. 2. Know by heart/quickly derive number bonds to 100 and to £1. 3. Add to the next 100, £1 and whole number e.g. *234 + 66 = 300* e.g. *3·4 + 0·6 = 4.* 4. Perform place-value additions without a struggle e.g. *300 + 8 + 50 + 4000 = 4358.* 5. Add multiples of 0·1. 6. Add multiples and near multiples of 10, 100 and 1000. 7. Calculate near doubles using doubling and adjusting. 8. Add £1, 10p, 1p to amounts of money. 9. Use place value and number facts to add 1-, 2-, 3- and 4-digit numbers where a mental calculation is appropriate e.g. *4004 + 156 by knowing that 6 + 4 = 10 and that 4004 + 150 = 4154 so the total is 4160.*	 200 + 40 + 7 100 + 20 + 5 300 + 60 +12 = 372 247 +125 12 60 300 372   	Empty Number Line  As with year three, breaking down the equation using mental maths strategies such as number bonds. **AND** Bar Model/Part Whole   	Partitioning **(as seen above but with thousands)** **AND** Expanded Column (for whole and decimal numbers).  Decimal points should be aligned **AND** Short Column (whole numbers) 442 + 335 = 777 7872 + 541 = 8413 4 4 2 3 3 5 + 7 7 7 1 1 7 8 7 2 5 4 1 + 8 4 1 3 *Exchanging through columns should be shown above the next column along (so the children do not forget to add this on).*
		Pupils should start to have preferences in methods for both mental and formal calculating and start to consider which method is better suited.	

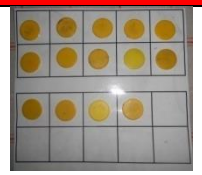
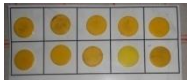
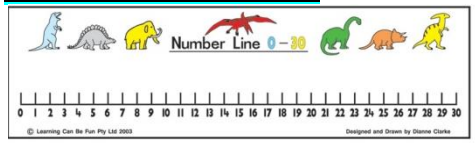
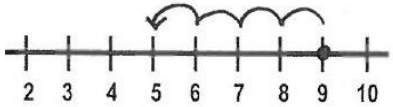
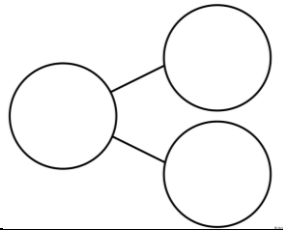
Year 5:	Add whole numbers with **more than 4 digits** including using formal written methods (columnar addition). Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve addition multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know number bonds to 1 (1dp), e.g. 0 + 1 = 1, 0.1 + 0.9 = 1 etc. 2. Add to the next 10 from a decimal number, e.g. *13·6 + 6·4 = 20.* 3. Add numbers with 2 significant digits only, using mental strategies, e.g. *3·4 + 4·8* e.g. *23 000 + 47 000.* 4. Add 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000, e.g. *8000 + 7000* e.g. *600 000 + 700 000.* 5. Add near multiples of 10, 100, 1000, 10 000 and 100 000 to other numbers, e.g. *82 472 + 30 004.* 6. Add decimal numbers which are near multiples of 1 or 10, including money, e.g. *6·34 + 1·99* e.g. *£34·59 + £19·95.* 7. Use place value and number facts to add two or more 'friendly' numbers, including money and decimals, e.g. *3 + 8 + 6 + 4 + 7* e.g. *0·6 + 0·7 + 0·4.*	  	Empty Number Line ***(as seen above but up to hundred thousands)*** **AND** Bar Model/Part Whole  	Partitioning **AND** Expanded Column (for whole and decimal numbers). ***(as seen above but up to hundred thousands)*** **AND** Short Column (for whole and decimal numbers).   Decimal points should be aligned *Exchanging through columns should be shown above the next column along (so the children do not forget to add this on).*

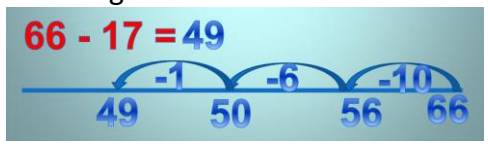
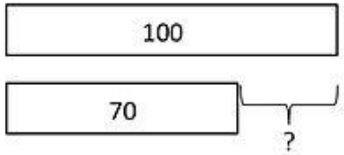
Pupils start to build confidence, accuracy and consistency in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if: both values are small, the value being added on is small, no or few place value boundaries are gone through. Pupils should now know that expanded is not an efficient method but instead a tool to support place value.***

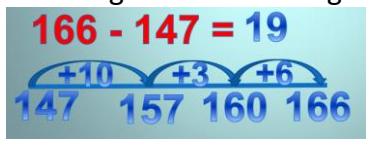
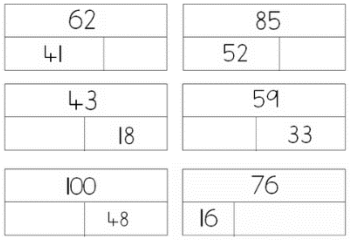
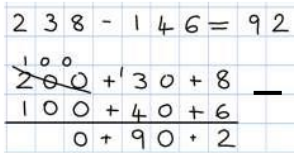
Year 6:	Add whole numbers up to millions including using formal written methods (columnar addition). Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve addition multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Add two 1dp numbers or two 2dp numbers less than 1 e.g. *4·5 + 6·3* e.g. *0·74 + 0·33.* 2. Know by heart number bonds to 100 and use these to derive related facts, e.g. *3·46 + 0·54.* 3. Derive, quickly and without difficulty, number bonds to 1000. 4. Add small and large whole numbers where the use of place value or number facts makes the calculation do-able mentally, e.g. *34 000 + 8000.* *5.* Add multiples and near multiples, e.g. *6345 + 199.* 6. Add negative numbers in a context such as temperature where the numbers make sense. 7. Add positive numbers to negative numbers e.g. *Calculate a rise in temperature.*	 	Empty Number Line ***(as seen above but up to millions)*** **AND** Bar Model/Part Whole	Partitioning **AND** Expanded Column (for whole and decimal numbers). ***(examples of these can be seen above but now up to millions)*** **AND** Short Column (for whole and decimal numbers). 2 1 2 23·361 9·08 + 59·77 1·3 93·511 Tenths, hundredths and thousandths should be correctly aligned. *Exchanging through columns should be shown above the next column along (so the children do not forget to add this on).*

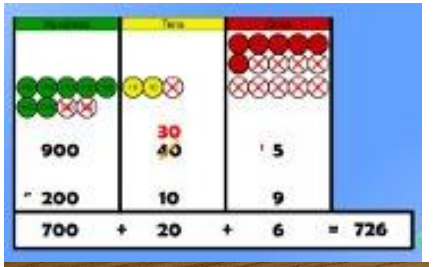
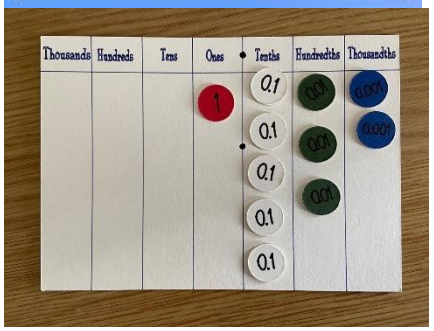
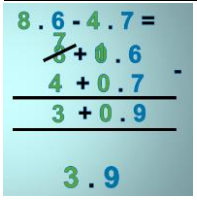
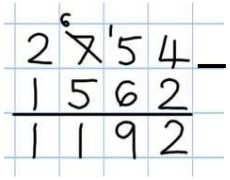
Pupils should become confident, accurate and consistent in their efficiency when calculating.
Pupils start to build confidence, accuracy and consistency in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if: both values are small, the value being added on is small, no or few place value boundaries are gone through. Pupils should now know that expanded is not an efficient method but instead a tool to support place value.***

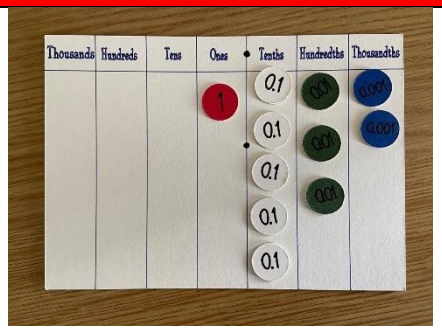
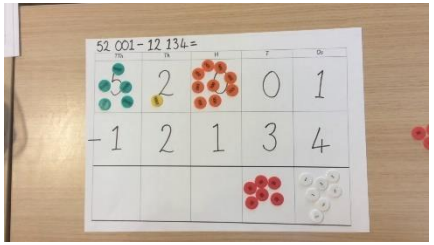
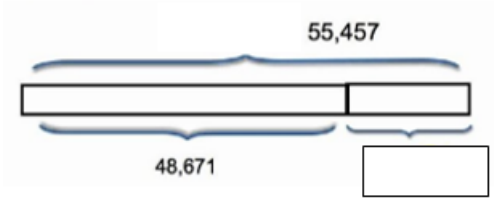
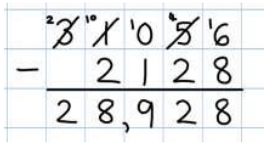
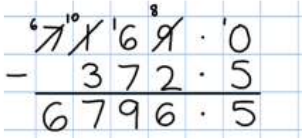
Subtraction

Year 1	Read, write and interpret mathematical statements involving subtraction and the equals sign. Solve one-step problems that involve addition using concrete objects and pictorial representation and missing number problems. Subtract one-digit and two-digit numbers to 20, including zero TO- O		
Mental	**Concrete**	**Pictorial**	**Abstract**
1. Recall all number bonds of single digit numbers. 2. Recall all number bonds to 10 (in any order). 3. Recall one less than a given number up to 10. 4. Recall all number bonds to 20 (in any order) (adding and subtracting). 5. Recall one less than (up to 20). 6. Count back in 10s from any given 2-digit number 7. Subtract 10 from any given 2-digit number 8. Use known facts to work out unknown facts, e.g. *7 – 2 = 5 to work out 27 – 2, 37 – 2* 9. Work out the corresponding addition facts.	 14 – 4 = 10 	Numbered Number Line  **AND** Empty Number Line  **AND** Part Whole 	9 – 4 = 5

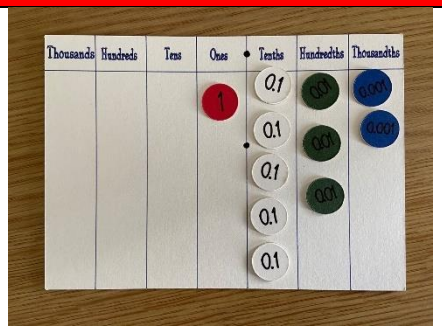
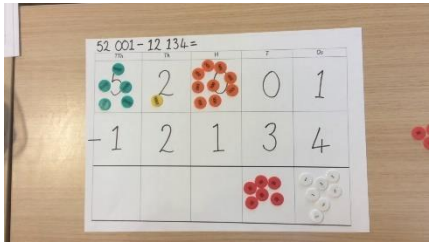
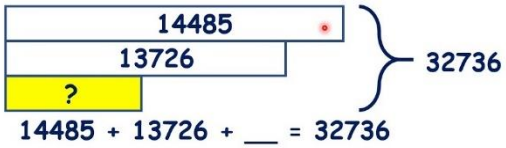
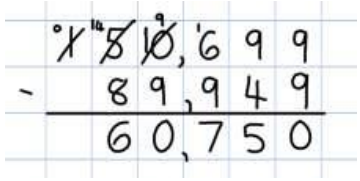
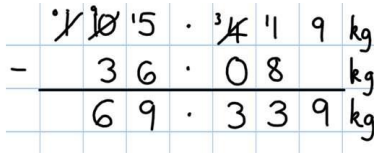
Year 2	Recognise the place value of each digit in a two-digit number (tens, ones), Subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones TO + O; a two-digit number and tens TO + T; two two-digit numbers TO +TO. Show that subtraction of two numbers cannot be done in any order (not commutative). Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Recall all number bonds to 20 fluently (addition). 2. Recall all number bonds to 100 (adding multiples of 10). 3. Recall combinations of pairs of numbers, i.e. 5 = 0 + 5 = 1 + 4 = 2 + 3 = 3 + 2 = 4 + 1 = 5 + 0. 4. Subtract 9 from by subtracting 10, adding 1. 5. Recall ten less than any given number (up to 100), i.e. 37, 28 etc. 6. Subtract a 1-digit number from a 1 or 2-digit number using number facts ('make ten'/bridging multiples of 10).	 	Empty Number Line Counting back  Using number bonds to support mental maths **AND** Bar Model/Part Whole  100 – 30 = 70	Partitioning 92 – 7 = 85 (subtract the 2 to get to a boundary and then subtract the remaining 5 using number bonds) 76 - 41 = 35 76 – 48 = 28 76 - 40 = 36 76 – 40 = 36 36 - 1 = 35 36 - 6 = 30 30 - 2 = 28 **AND** Expanded Column 77 – 42 = 70 + 7 _ 40 + 2 30 + 5 = **35**

Year 3:	Subtract numbers **with up to three digits**, using the formal written methods of columnar subtraction. Estimate the answer to a calculation and use inverse operations to check answers. Solve missing number problems, using number facts, place value and complex subtraction.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know pairs with each total to 20, e.g. *8 – 2 = 6* e.g. *18 – 6 = 12* e.g. *15 – 8 = 7.* 2. Subtract any two 2-digit numbers by counting back in 10s and 1s by using partitioning. 3. Perform place-value subtractions without a struggle e.g. *536 – 30 = 506* 4. Subtract 2-digit numbers from numbers > 100 by counting up e.g. *143 – 76 is done by starting at 76. Then add 4 (80), then add 20 (100), then add 43, making the difference a total of 67* 5. Subtract multiples and near multiples of 10 and 100 6. Subtract, when appropriate, by counting back or taking away, using place value and number facts. 7. Find change from £1, £5 and £10. 8. Calculate 100 less than any given number (up to 1,000).	72 - 47  Introduce 'exchanging' through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.	Empty Number Line Counting on and counting back.  Count on from the smaller value number – only efficient when both numbers are similar in value  Counting back. Again (as with addition), children need to be secure in subtracting multiples of ten. Bar Model/Part Whole  	Partitioning Again, pupils should subtract to reach a boundary (partitioning individual values). 376 - 41 = 35 626 – 148 = 478 376 - 40 = 336 626 – 100 = 526 336 - 1 = 335 526 – 20 = 506 506 – 20 = 486 486 – 6 = 480 480 – 2 = 478 **AND** Expanded Column Once pupils are secure with the understanding of 'exchanging', they can use expanded column to subtract 2 and 3-digit numbers.  ***Short column can be taught when secure later in the year.***

Year 4:	Subtract numbers **with up to 4 digits** using the formal written methods of columnar addition where appropriate. Estimate and use inverse operations to check answers to a calculation. Solve subtraction two-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Subtract any two 2-digit numbers by partitioning and counting back. 2. Know by heart/quickly derive number bonds to 100 and to £1. 3. Perform place-value subtractions without a struggle e.g. *4736 – 706 = 4030.* 4. Subtract multiples and near multiples of 10, 100, 1000, £1 and 10p. 5. Subtract multiples of 0·1. 6. Subtract by counting up e.g. *503 – 368 is done by adding 368 + 2 + 30 + 100 + 3 (so we added 135).* 7. Subtract, when appropriate, by counting back or taking away, using place value and number facts. 8. Subtract from 100, £1 and one whole. 9. Subtract £1, 10p, 1p from amounts of money. 10. Find change from £10, £20 and £50.	 	Empty Number Line ***Counting on and counting back (as seen above but up to thousands)*** Bar Model/Part Whole 1,102 807 ? 298 159 ? 112	Partitioning ***(as seen above but with thousands)*** **AND** Expanded Column (for whole and decimal numbers).  Decimal points should be aligned **AND** Short Column (whole numbers) Short column with 'exchanging' (decomposition).  *Exchanging through columns should be shown above (like with addition).*
		Pupils should start to have preferences in methods for both mental and formal calculating and start to consider which method is better suited.	

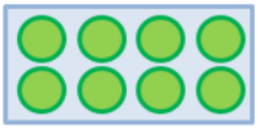
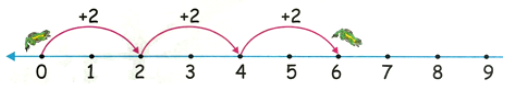
Year 5:	Subtract involving whole numbers with **more than 4 digits** including using formal written methods (columnar subtraction). Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve subtraction multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Subtract numbers with 2 significant digits only, using mental strategies, e.g. *6·2 – 4·5* e.g. *72 000 – 47 000.* 2. Subtract 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000, e.g. *8000 – 3000* e.g. *60 000 – 200 000.* 3. Subtract 1- or 2-digit near multiples of 10, 100, 1000, 10 000 and 100 000 from other numbers, e.g. *82 472 – 30 004.* 4. Subtract decimal numbers which are near multiples of 1 or 10, including money, e.g. *6·34 – 1·99* e.g. *£34·59 – £19·95.* 5. Use counting up subtraction, with knowledge of number bonds to 10, 100 or £1, as a strategy to perform mental subtraction, e.g. *£10 – £3·45 or 1000 – 782.* 6. Recognise fraction complements to 1 and to the next whole number, e.g. $1\,^{2}/_{5} + {}^{3}/_{5} = 2$.	  	Empty Number Line ***Counting on and counting back (as seen above but up to hundred thousands)*** Bar Model/Part Whole  	Partitioning **AND** Expanded Column (for whole and decimal numbers). ***(examples of these can be seen above but now up to hundred thousands)*** **AND** Short Column (for whole and decimal numbers)  Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point.  *Exchanging through columns should be shown above (like with addition).*

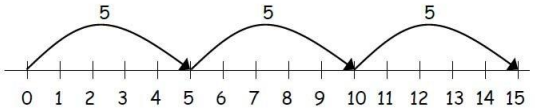
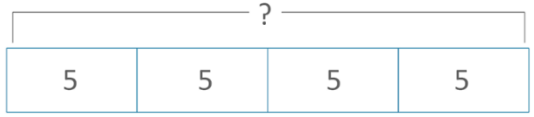
Pupils start to build confidence, accuracy and consistency in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if: both values are small, the value being added on is small, no or few place value boundaries are gone through. Pupils should now know that expanded is not an efficient method but instead a tool to support place value.***

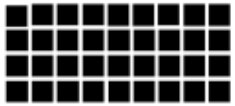
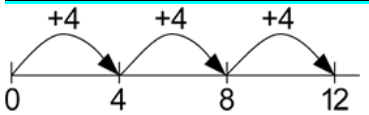
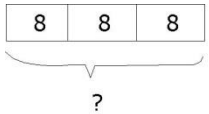
Year 6:	Subtract whole numbers up to millions including using formal written methods (columnar subtraction). Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve subtraction multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Use number bonds to 100 to perform mental subtraction of any pair of integers by complementary addition. e.g. *1000 – 654 as 46 + 300 in our heads.* 2. Use number bonds to 1 and 10 to perform mental subtraction of any pair of 1dp or 2dp numbers using complementary addition and including money, e.g. *10 – 3·65 as 0·35 + 6* e.g. *£50 – £34·29 as 71p + £15.* 3. Use number facts and place value to perform mental subtraction of large numbers or decimal numbers with up to 2 places, e.g. *467 900 – 3005* e.g. *4·63 – 1·02.* 4. Subtract multiples and near multiples. 5. Subtract negative numbers in a context such as temperature where the numbers make sense.	  	Empty Number Line ***Counting on and counting back (as seen above but up to millions)*** Bar Model/Part Whole  Solving multi-step problems using bar models.	Partitioning **AND** Expanded Column (for whole and decimal numbers). ***(examples of these can be seen above but now up to millions)*** **AND** Short Column (for whole and decimal numbers)   Tenths, hundredths and thousandths should be correctly aligned. *Exchanging through columns should be shown above (like with addition).*

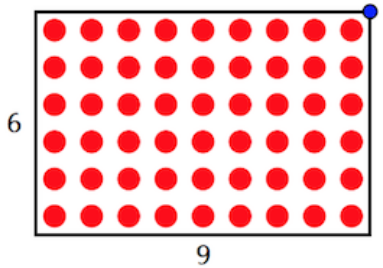
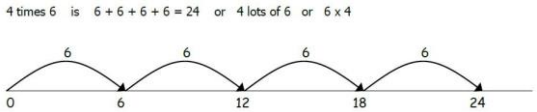
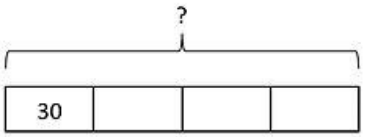
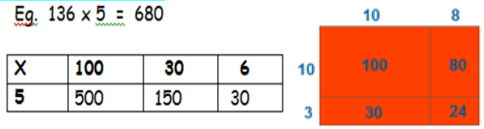
Pupils should become confident, accurate and consistent in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if: both values are small, both values are similar (count on), the value being subtracted is small, no or few place value boundaries are gone through. Pupils should now know that expanded is not an efficient method but instead a tool to support place value.***

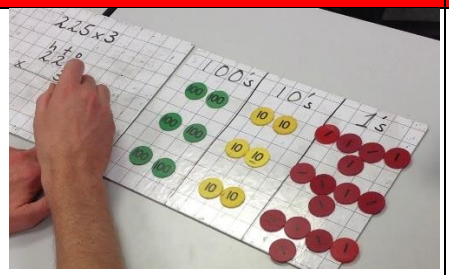
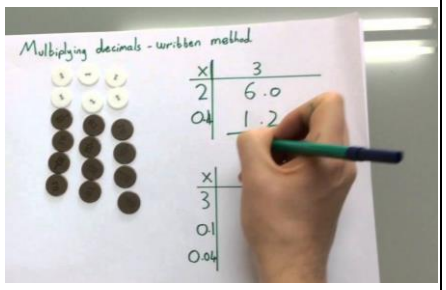
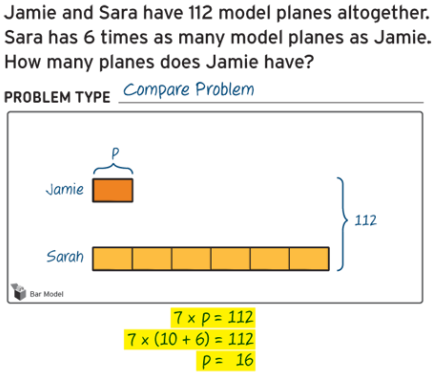
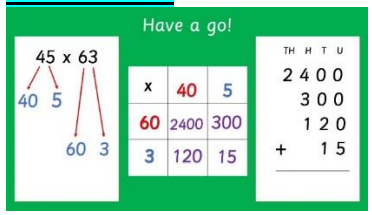
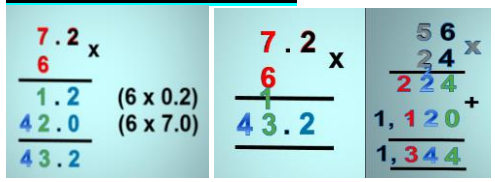
Multiplication

Year 1:	Solve one-step problems involving multiplication, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Count in multiples of twos, fives and tens.		
Mental	**Concrete**	**Pictorial**	**Abstract**
1. Count in multiples of 2 (starting at 0). 2. Count in multiples of 5 (starting at 0). 3. Count in multiples of 10 (starting at 0). 4. Double numbers within 10. 5. Double numbers within 20. 6. Makes links between doubling and halving facts.	How many legs will 3 teddies have? 2 + 2 + 2 = 6 (using little toy teddies) 	Grouping Making sets: eg 3 sets / lots of 4  leading to 4 + 4 + 4 **AND** Arrays What is double 4?  **AND** Repeated Addition (number line) 	2 + 2 + 2 = 6

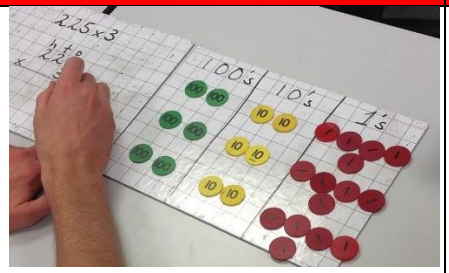
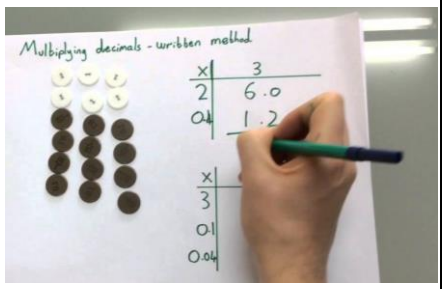
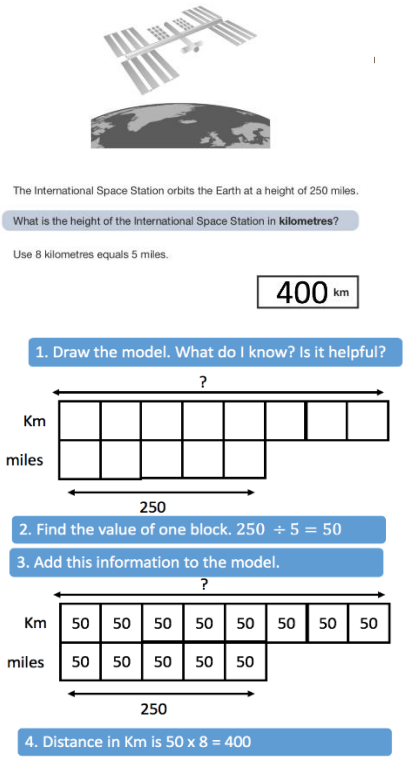
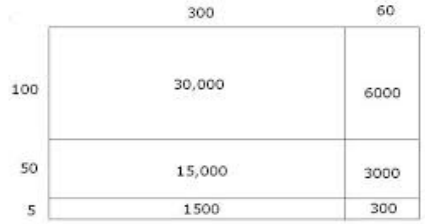
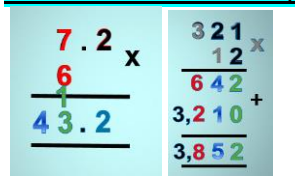
Year 2:	Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs TO x O or O x TO. Recall 2,5 and 10 times tables. Show that multiplication of two numbers can be done in any order (commutative) Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Count in multiples of 2, 5 and 10 (from 0 and other starting points). 2. All multiplication facts for 2 times table (including 0x). 3. All multiplication facts for 5 times table (including 0x). 4. All multiplication facts for 10 times table (including 0x). 5. Begin to count in multiples of 3. 6. Use division facts (inverse). 7. Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5. 8. Find $^1/_2$, $^1/_3$, $^1/_4$ and $^3/_4$ of a quantity of objects and of amounts (whole number answers) using division (denominator) and then multiplication (numerator).	Use counters to create an array	Grouping ***(as shown above)*** **AND** Arrays 1x10 2x5 XXXXXXXXXX XXXXX 1 row of 1 XXXXX 2 rows of 5 **AND** Repeated Addition (number line)  ***2x, 5x, 10x*** **AND** Bar Model/Part Whole  	Partitioning 12 x 5 10 x 5 = 50 2 x 5 = 10 50 + 10 = 60

Year 3:	Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to efficient written methods. Solve problems, including missing number problems, involving multiplication. Estimate the answer to a calculation and use inverse operations to check answers. Recall and use multiplication facts for the 3, 4 and 8 times table.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the multiplication facts in the ×2, ×3, ×4, ×5, ×8 and ×10 tables. 2. Using doubling (x2), double double or the 2 x table(x4) and double double double or the 4 x table (x8). 3. Multiply whole numbers by 10 and 100 (moving the digits). 4. Recognise that multiplication (like addition) is commutative. 5. Use place value and number facts in mental multiplication e.g. *30 × 5 is 15 × 10.* *6.* Use place value and number facts in mental multiplication e.g. 3 x 6 = 18 so 3 x 60 = 180. 7. Partition teen numbers to multiply by a 1-digit number e.g. *3 × 14 as 3 × 10 and 3 × 4* 8. Double numbers up to 50.	 4 x 6 = 24  6 x 4 = 24	Arrays  9 x 4 = 36 **AND** Repeated Addition (number line)  *2x, 5x, 10x* *3x, 4x, 8x* **AND** Bar Model/Part Whole  3 x 8 = ?	Partitioning 12 x 3 = 10 x 3 = 30 2 x 3 = 6 30 + 6 = 36 **AND** Grid Method 35 x 7 = 245 x | 30 | 5 7 | 210 | 35 210 + 35 = 245

Year 4:	Multiply **two-digit and three-digit numbers** by a one-digit number using a formal written layout. Use the distributive law to multiply two digit numbers by one digit. Solve problems involving multiplying, deciding which operations and methods to use and why, estimating and using inverse to check answers. Recall all multiplication facts for multiplication tables up to 12 x 12.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the multiplication facts up to 12 × 12. 2. Use doubling (x3 to x6, and x6 to x12). 3. Recognise factors up to 12 of 2-digit numbers. 4. Multiply whole numbers and 1-place decimals by 10, 100, 1000. 5. Multiply multiples of 10, 100 and 1000 by 1-digit numbers e.g. *300 × 6* e.g. *4000 × 8.* 6. Use understanding of place value and number facts in mental multiplication e.g. *36 × 5 is half of 36 × 10* e.g. *50 × 60 = 3000.* 7. Partition 2-digit numbers to multiply by a 1-digit number mentally e.g. *4 × 24 as 4 × 20 and 4 × 4.* 8. Multiply near multiples by rounding e.g. *33 × 19 as (33 × 20) – 33.* 9. Find doubles to double 100 and beyond using partitioning. 10. Begin to double amounts of money e.g. *£35·60 doubled is £71·20.*		Repeated Addition (number line)  *2x, 5x, 10x* *3x, 4x, 8x* *6x, 7x, 9x, 11x, 12x* **AND** Bar Model  30 × 4 = 120	Partitioning 125 x 3 = 100 x 3 = 300 20 x 3 = 2 x 3 x 10 = 6 x 10 = 60 5 x 3 = 15 **300 + 60 + 15 = 375** **AND** Grid Method Eg. 136 x 5 = 680  *Encourage column addition to add accurately.* **AND** Expanded Short Column (whole numbers) 89 x 7 63 (7 x 9) 560 (7 x 8 x 10) 623 *Exchanging through columns should be shown above (consistent with addition and subtraction).*
		Pupils should start to have preferences in methods for both mental and formal calculating and start to consider which method is better suited.	

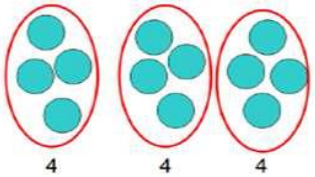
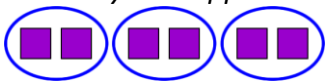
Year 5:	Multiply numbers **up to 4 digits by a one- or two-digit number** using a formal written method, including long multiplication for two-digit numbers Solve problems involving multiplication, including fractions, deciding which operations and methods to use and why. Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Count in multiples of decimals, e.g. 0.1, 0.2, 0.3 e.g. 0.3, 0.6, 0.9. 2. Know by heart all the multiplication facts up to 12 × 12. 3. Use multiplication facts to calculate multiples of 10, e.g. 20x, 30x, 40x tables. 4. Multiply whole numbers and 1- and 2-place decimals by 10, 100, 1000, 10 000. 5. Use knowledge of factors and multiples in multiplication, e.g. *43 × 6 is double 43 × 3* e.g. *28 × 50 is $^1/_2$ of 28 × 100 = 1400.* 6. Use knowledge of place value and rounding in mental multiplication, e.g. *67 × 199 as 67 × 200 – 67.* 7. Use doubling and halving as a strategy in mental multiplication, e.g. *58 × 5 is half of 58 × 10* e.g. *34 × 4 is 34 doubled twice.* 8. Partition 2-digit numbers, including decimals, to multiply by a 1-digit number mentally e.g. *6 × 27 as 6 × 20 (120) plus 6 × 7 (42)* e.g. *6·3 × 7 as 6 × 7 (42) plus 0·3 × 7 (2·1).* 9. Double amounts of money by partitioning, e.g. *£37·45 doubled is £37 doubled (£74) plus 45p doubled (90p) giving a total of £74·90.* 10. Know how to square and cube numbers.	  	Repeated Addition (number line) ***(as shown above) up to 12x12*** **AND** Bar Model  	Partitioning ***(as above but now up to thousands x 1 digit and x 2 digit)*** **AND** Grid Method  **AND** Expanded and Short Column (for whole and decimal numbers)  *Exchanging through columns should be shown above (consistent with addition and subtraction).*	

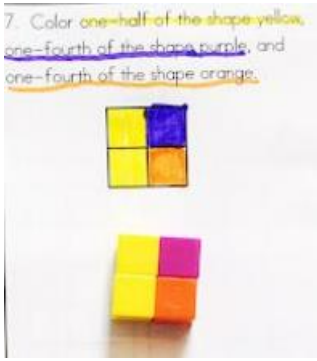
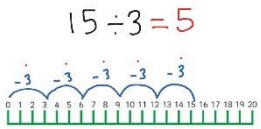
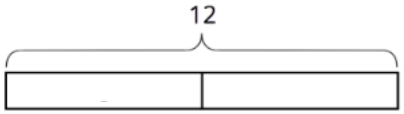
Pupils start to build confidence, accuracy and consistency in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if it's for jotting purposes, where small values are used to mentally calculate. Again, pupils should now know that expanded is not an efficient method.***

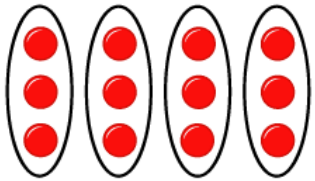
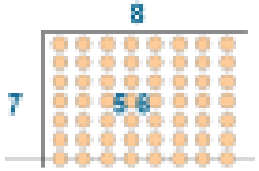
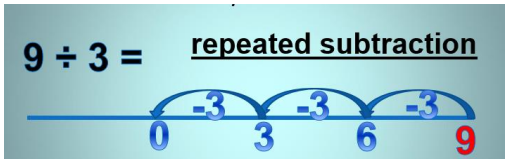
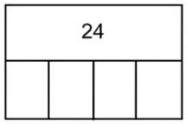
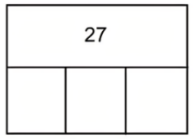
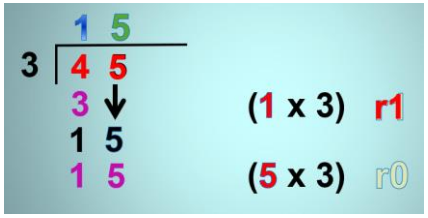
Year 6:	Multiply **multi-digit numbers up to 4 digits by a two-digit whole number** using the formal written method of long multiplication. Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve multiplication multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the multiplication facts up to 12 × 12. 2. Use multiplication facts to calculate decimals, e.g. 0.2x, 0.3x, 0.4x tables. 3. Multiply whole numbers and decimals with up to 3 places by 10, 100 or 1000 e.g. *234 × 1000 = 234 000* e.g. *0·23 × 1000 = 230.* 4. Identify common factors, common multiples and prime numbers and use factors in mental multiplication. e.g. *326 × 6 is 652 × 3 which is 1956.* 5. Use place value and number facts in mental multiplication e.g. *4000 × 6 = 24 000* e.g. *0·03 × 6 = 0·18.* 6. Use doubling and halving as mental multiplication strategies, including to multiply by 2, 4, 8, 5, 20, 50 and 25 e.g. *28 × 25 is a quarter of 28 × 100 = 700.* 7. Use rounding in mental multiplication e.g. *34 × 19 as (34 × 20) – 34.* 8. Multiply 1- and 2-dp by numbers up to and including 10 using place value and partitioning e.g. *3·6 × 4 is 12 + 2·4* e.g. *2·53 × 3 is 6 + 1·5 + 0·09.* 9. Double decimal numbers with up to 2 places using partitioning e.g. *36·73 doubled is double 36 (72) plus double 0·73 (1·46).*	  	Repeated Addition (number line) ***(as shown above) up to 12x12*** **AND** Bar Model/Part Whole  	Partitioning ***(as above but now up to thousands x 2 digit)*** **AND** Grid Method  **AND** Expanded and Short Column (for whole and decimal numbers)  *Exchanging through columns should be shown above (consistent with addition and subtraction).*

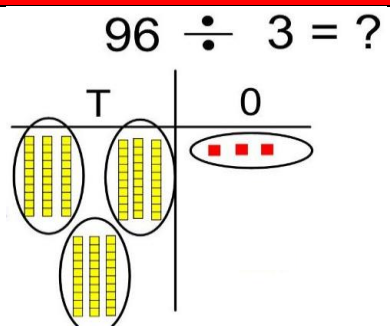
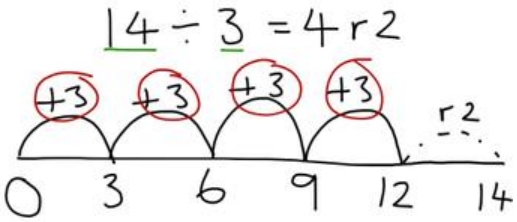
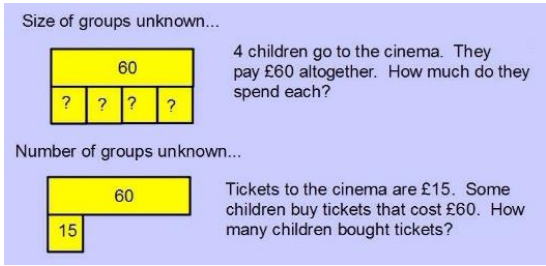
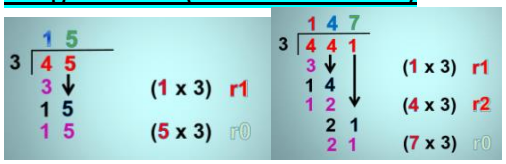
Pupils should become confident, accurate and consistent in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if it's for jotting purposes, where small values are used to mentally calculate. Again, pupils should now know that expanded is not an efficient method.***

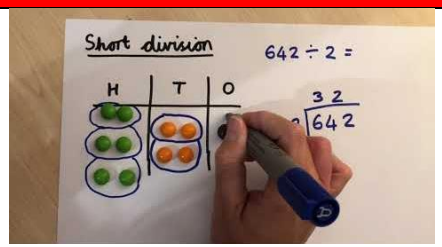
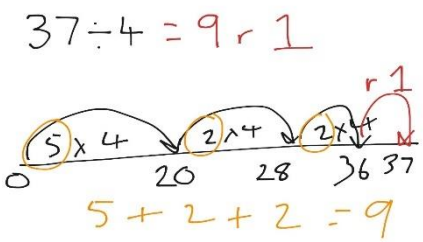
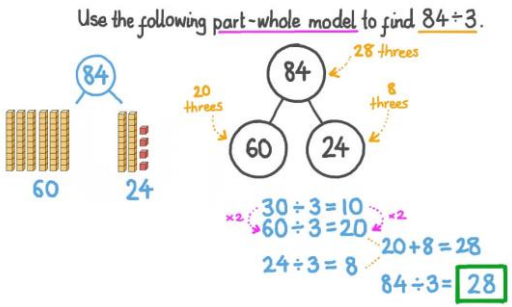
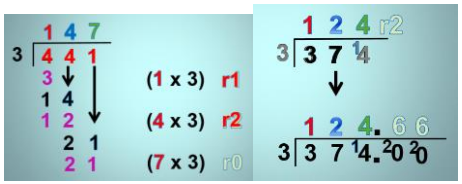
Division

Year 1:	Solve simple one-step problems involving division, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.		
Mental	**Concrete**	**Pictorial**	**Abstract**
1. Halve numbers up to 10. 2. Halve numbers up to 20. 3. Make links between doubling and halving facts.	'Share 20 crayons between 2 pots.' 'How many crayons are in each pot?' 'Put 20 crayons into groups of 10. How many pots do we need?' ***<u>With manipulatives in the learning environment.</u>***	<u>Grouping</u>  12 shared between 3 is 4 **AND** <u>Arrays</u> *Use arrays to support early division*  How many groups of two?' 'Three groups of two' How many groups of 3?' 'Two groups of three' **AND** <u>Repeated Subtraction (number line)</u> This supports counting backwards in multiples, i.e. 2s.	10÷2=5

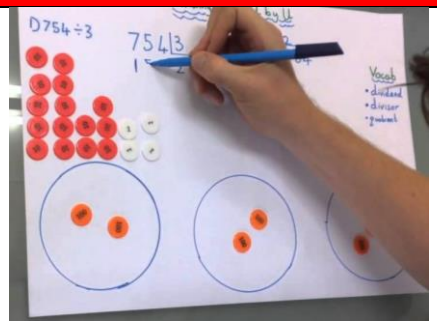
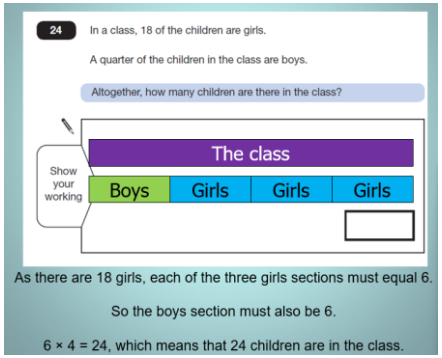
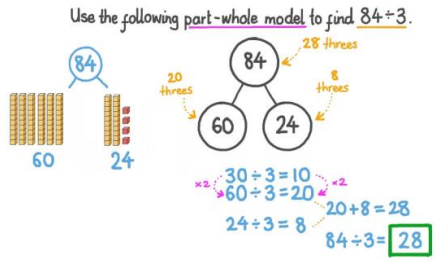
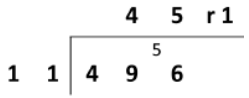
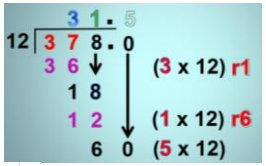
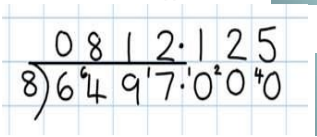
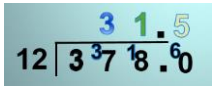
Year 2:	Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs TO ÷ O. Recall 2,5 and 10 times tables (using inverse (division facts)). Show that division cannot be done in any order (not commutative). Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Count in multiples of 2, 5 and 10 (from 0 and other starting points). 2. All division facts for 2 times table (including 0x). 3. All division facts for 5 times table (including 0x). 4. All division facts for 10 times table (including 0x). 5. Begin to count in multiples of 3. 6. Use multiplication facts (inverse). 7. Begin to halve numbers to 40 and multiples of 10 to 100. 8. Find $^1/_2$, $^1/_3$, $^1/_4$ and $^3/_4$ of a quantity of objects and of amounts (whole number answers) using division (denominator) and then multiplication (numerator).	 	Grouping There are 6 sweets, how many people can have 2 sweets each?  **AND** Arrays and Number Lines Use arrays to support division 15 ÷ 5 = 3 and 15 ÷ 3= 5 Use an empty number line to count forwards or back in equal steps  **AND** Bar Model/Part Whole 	Partitioning 25 ÷ 5 = 20 ÷ 5 = 4 5 ÷ 5 = 1 4 + 1 = 5 Then applied to greater values within 2, 5 and 10 times tables, i.e. 55 ÷ 5, using 10 x (50) as a step.

Year 3:	Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to efficient written methods. Solve problems, including missing number problems, involving division. Estimate the answer to a calculation and use inverse operations to check answers. Recall and use division facts for the 3, 4 and 8 times table.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the division facts derived from the ×2, ×3, ×4, ×5, ×8 and ×10 tables. 2. Using halving (÷2), halve halve or the 2 x table (÷4) and halve halve halve or the 4 x table (÷8). 3. Divide whole numbers by 10 or 100 to give whole number answers (moving the digits). 4. Recognise that division (like subtraction) is not commutative. 5. Use place value and number facts in mental division e.g. *84 ÷ 4 is half of 42.* *6.* Use place value and number facts in mental division e.g. 18 ÷ 3 = 6 so 180 ÷ 3 = 60. 7. Divide larger numbers mentally by subtracting the 10th multiple as appropriate, including those with remainders, e.g. *57 ÷ 3 is 10 + 9 as 10 × 3 = 30 and 9 × 3 = 27.* 8. Halve even numbers to 100, halve odd numbers to 20 (giving answers in halves).	 5 x 3 = 15  15÷3= __ 15÷5= __  ***<u>With counters, cubes, dienes.</u>***	<u>Arrays</u>  <u>Repeated Addition/Subtraction Number Lines</u>  **AND** <u>Bar Model/Part Whole</u> 24 ÷ 4 =  27 ÷ 3 = 	<u>Partitioning</u> Use of inverse operation to solve division. 36 ÷ 3 = 30 ÷ 3 = 10 6 ÷ 3 = 2 10 + 2 = 12 And applying this approach to any problem in the 2, 5, 10, 3, 4 and 8 times tables. **AND** <u>Long Division (no remainders)</u> 

Year 4:	Divide **two-digit and three-digit numbers** by a one-digit number using a formal written layout. Solve problems involving dividing, deciding which operations and methods to use and why, estimating and using inverse to check answers. Recall all division facts for multiplication tables up to 12 x 12.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the division facts up to 144 ÷ 12. 2. Use halving (x6 to x3, and x12 to x6). 3. Divide whole numbers by 10, 100, to give whole number answers or answers with 1 decimal place. 4. Divide multiples of 100 by 1-digit numbers using division facts e.g. *3200 ÷ 8 = 400.* 5. Use place value and number facts in mental division e.g. *245 ÷ 20 is half of 245 ÷ 10.* 6. Divide larger numbers mentally by subtracting the 10th or 20th multiple as appropriate e.g. *156 ÷ 6 is 20 + 6 as 20 × 6 = 120 and 6 × 6 = 36.* 7. Find halves of even numbers to 200 and beyond using partitioning. 8. Begin to halve amounts of money e.g. *half of £52·40 is £26·20.*		Repeated Addition/Subtraction Number Lines  ***Working with remainders.*** **AND** Bar Model/Part Whole 	Partitioning 126 ÷ 5 = 25 r1 5 x 20 = 100 5 x 5 = 25 125 + 1 = 126 **AND** Long Division (with remainders)  1. Limit numbers to **NO** remainders in the final answer **OR** occurring within the number/calculating (each digit must be a multiple of the divisor). 2. Limit numbers to **NO** remainders in the final answer, but with remainders occurring within. 3. Allow a remainder to be in the final answer but the answer provided shows the remaining amount just as a remainder. ***Move on to short division when secure, focusing on the order of difficulty set out above (exact multiples first).***	
		Pupils should start to have preferences in methods for both mental and formal calculating and start to consider which method is better suited.	

Year 5:	Divide numbers **up to 4 digits by a one-digit number** using a formal written method of short division and interpret remainders appropriately for the context. Solve problems involving multiplication, including fractions, deciding which operations and methods to use and why. Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. 1. Know by heart all the division facts up to 144 ÷ 12. 2. Use division facts to calculate multiples of 10, e.g. 20x, 30x, 40x tables. 3. Divide whole numbers by 10, 100, 1000, 10 000 to give whole number answers or answers with 1, 2 or 3 decimal places. 4. Use doubling and halving as mental division strategies e.g. *34 ÷ 5 is (34 ÷ 10) × 2.* 5. Use knowledge of multiples and factors, as well as tests for divisibility, in mental division e.g. *246 ÷ 6 is 123 ÷ 3* e.g. *We know that 525 divides by 25 and by 3.* 6. Halve amounts of money by partitioning e.g. *$^1/_2$ of £75·40 = $^1/_2$ of £75 (£37·50) plus half of 40p (20p) which is £37·70.* 7. Divide larger numbers mentally by subtracting the 10th or 100th multiple as appropriate e.g. *96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36* e.g. *312 ÷ 3 is 100 + 4 as 100 × 3 = 300 and 4 × 3 = 12.* 8. Know tests for divisibility by 2, 3, 4, 5, 6, 9 and 25. 9. Know square numbers and cube numbers. 10. Reduce fractions to their simplest form.		Repeated Addition/Subtraction Number Lines  **AND** Bar Model/Part Whole  ***Using factors/multiples to break down equation.***	Partitioning ***(as above but with thousands ÷ one digit)*** **AND** Long and Short (one digit) division (remainders into decimals)  1. Limit numbers to **NO** remainders in the final answer, but with remainders occurring within. 2. Allow a remainder to be in the final answer AND show how to continue the calculating into a decimal BUT only to 1 or 2 dp. *Exchanging through columns should be shown above (consistent with addition and subtraction).*

Pupils start to build confidence, accuracy and consistency in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if it's for jotting purposes used to mentally calculate. Pupils should know that long division (although learnt for place value purpose) is necessary with two digit division.***

Year 6:	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 whole number** using the formal written method of short division, and interpret remainders according to the context Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve multiplication multi-step problems, deciding which operations and methods to use and why.		
Mental	**Concrete**	**Pictorial**	**Abstract**
See above objectives. **Calculating a decimal remainder** 1. Know by heart all the division facts up to 144 ÷ 12. 2. Use multiplication facts to calculate decimals, e.g. 0.2x, 0.3x, 0.4x tables. 3. Divide whole numbers by 10s to give whole number answers or answers with up to 3 decimal places. 4. Identify common factors, common multiples and primes numbers and use factors in mental division, e.g. *438 ÷ 6 is 219 ÷ 3 which is 73.* 5. Use tests for divisibility to aid mental calculation. 6. Use doubling and halving as mental division strategies, for example to divide by 2, 4, 8, 5, 20 and 25, e.g. *628 ÷ 8 is halved three times: 314, 157, 78·5.* 7. Divide 1- and 2-place decimals by numbers up to and including 10 using place value, e.g. *2·4 ÷ 6 = 0·4* e.g. *0·65 ÷ 5 = 0·13* e.g. *£6·33 ÷ 3 = £2·11.* 8. Halve decimal numbers with up to 2 places using partitioning, e.g. *Half of 36·86 is half of 36 (18) plus half of 0·86 (0·43).* 9. Know and use equivalence between simple fractions, decimals and percentages, including in different contexts. 10. Recognise a given ratio and reduce a given ratio to its lowest terms.		Repeated Addition/Subtraction Number Lines ***(as above but with thousands ÷ one digit)*** **AND** Bar Model/Part Whole  	Partitioning ***(as above but with thousands ÷ two digit)*** **AND** Long and Short (one and two digit) Division (remainders into decimals and fractions) 496 ÷ 11 = 45 r1  Answer: 45 $\frac{1}{11}$    *Pupils should understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers.* *Exchanging through columns should be shown above (consistent with addition and subtraction).*

Pupils should become confident, accurate and consistent in their efficiency when calculating. ***For example, a number line and partitioning are only efficient if it's for jotting purposes used to mentally calculate. Pupils should know that long division (although learnt for place value purpose) is necessary with two digit division.***