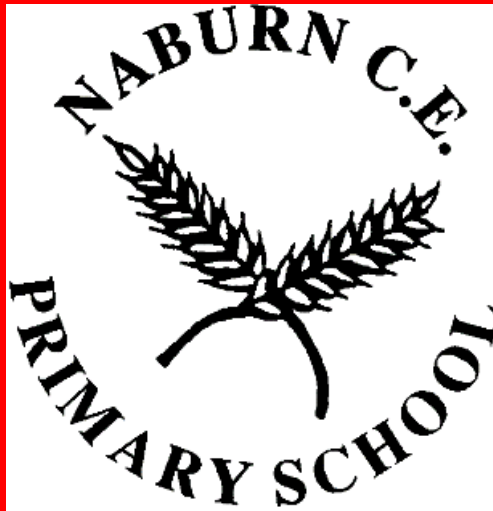


NABURN C OF E PRIMARY SCHOOL CALCULATION GUIDANCE 2020



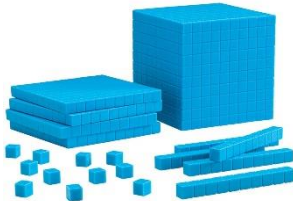
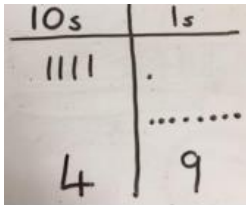
NABURN C OF E PRIMARY SCHOOL CALCULATION GUIDANCE

This guidance has been developed using the White Rose Maths Hub Calculation Guidance which sets out clear guidelines for the progression in calculation. Adaptations of this scheme are for the benefit of staff to show the steps children have made in previous years and the steps that they are required to make this year.

Each area also has a breakdown of objectives from the National Curriculum. It is however a guide, and it should be adapted to suit the needs of individual learners. Each child has individual needs and they should not be moved on to the next stage unless absolutely confident in the stage they are currently working on.

The guidance shows limited variations, therefore it is important that other representations are utilised when teaching to build a strong foundation across the content taught.

UNDERSTANDING THE GUIDANCE – THE 3 STEPS TO PROGRESSION (CPA APPROACH)

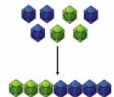

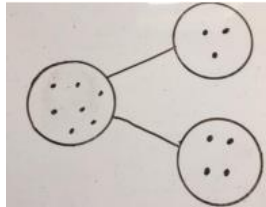
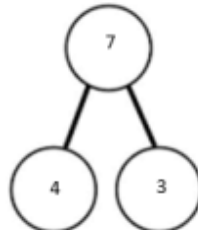
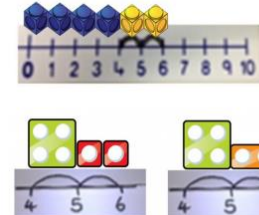

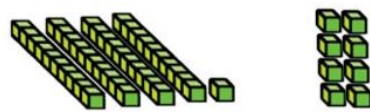
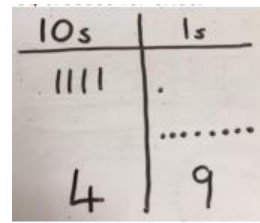
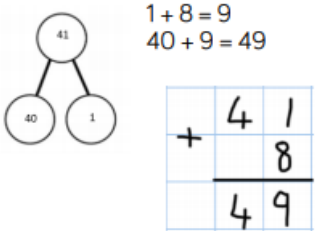
CONCRETE	PICTORIAL	ABSTRACT
Using physical objects to solve maths problems 	Using drawings and pictures to solve maths problems 	Solving maths problems using only numbers $\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ 11 \end{array}$

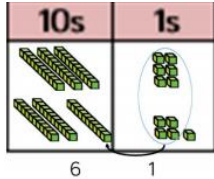
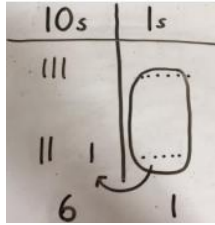
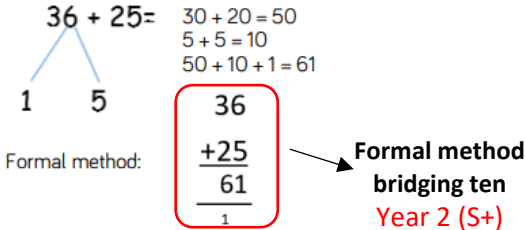
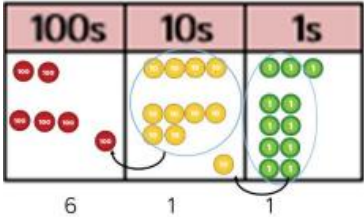
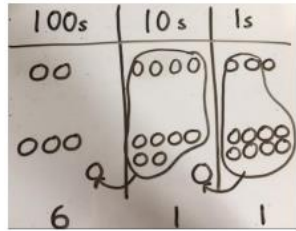
Addition Calculation Guidance

Key Vocabulary: add, plus, more, more than, sum, total, all together, increase, count on, parts and whole

Curriculum Statements

EYFS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
<ul style="list-style-type: none"> ► Count reliably with numbers from 1 to 20. ► Say which number is one more than a given number. ► Use quantities and objects, add two single-digit numbers and count on to find the answer. 	<ul style="list-style-type: none"> ► Represent and use number bonds within 20. ► Add one-digit and two-digit numbers to 20, including 0. ► Solve one step problems using concrete and pictorial representations and missing number problems. 	<ul style="list-style-type: none"> ► Recall and use facts to 20 fluently. ► Derive & use related facts to 100. ► Add: two-digit number and 1s; two – digit numbers and 10s; 2 two-digit numbers; 3 one-digit numbers. ► Show that addition of two numbers can be done in any order. 	<ul style="list-style-type: none"> ► Mentally add: three-digit number and 1s; three-digit number and 10s; three-digit number and 100s. ► Add three-digit numbers using written methods of columnar addition ► Add amounts of money to give change ► Estimate the answer to a calculation and use inverse operations to check answers 	<ul style="list-style-type: none"> ► Add four-digit numbers using formal written methods of columnar addition where appropriate. ► Estimate and use inverse operations to check answers to a calculation ► Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why 	<ul style="list-style-type: none"> ► Add whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) ► Add and subtract numbers mentally with increasingly large numbers ► Solve addition multi-step problems in contexts, deciding which operations and methods to use and why 	<ul style="list-style-type: none"> ► Carry out calculations involving the 4 operations ► Solve addition multi-step problems in contexts, deciding which operations and methods to use and why ► Solve problems involving addition, subtraction, multiplication and division ► Use estimation to check answers to calculations

	CONCRETE	PICTORIAL	ABSTRACT
EYFS	<p>Combining two parts to make a whole Use other physical resources too e.g. eggs, shells, teddy bears, cars.</p>  <p>Regrouping to make 10 Using tens frames, counters, cubes & Numicon.</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p>$4 + 3 = 7$</p> <p>4 is a part, 3 is a part and the whole is 7.</p> 
YEAR 1	<p>Counting on using number lines with cubes or Numicon.</p> 	<p>Children draw the number line and jumps to count on from a given number</p> 	<p>What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2?</p> <p>$4 + 2$</p>
YEAR 2	<p>TO + O using base 10 Continue to develop understanding of partitioning and place value.</p>  <p>TO + TO using base 10</p>	<p>Children to represent the base 10 using drawings e.g. lines for tens and dot/crosses for.</p> 	<p>Introduce formal written methods Part whole models, column addition and written calculations.</p> 

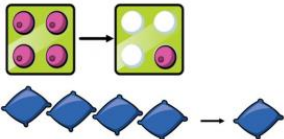
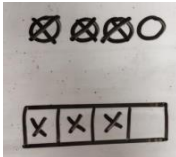
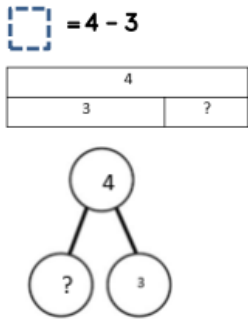

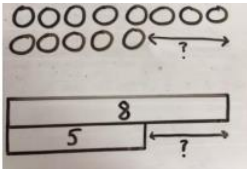
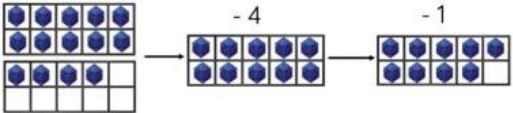
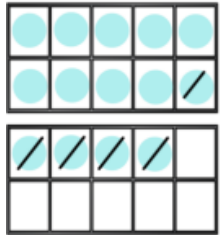
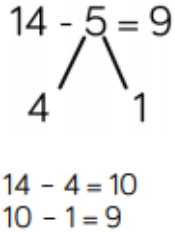
	<p>Continue to develop understanding of partitioning and place value. $36 + 25$</p> 	<p>Children to represent the base 10 in a place value chart.</p> 	<p>$36 + 25 =$</p> <p>1 5</p> <p>Formal method:</p>  <p>Formal method bridging ten Year 2 (S+)</p>
<p>YEAR 3</p> <p>YEAR 4</p> <p>YEAR 5</p> <p>YEAR 6</p>	<p>Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.</p> 	<p>Children to represent the counters in a place value chart, circling when they make an exchange.</p> 	<p>Column addition (formal written method) Any exchanges shown underneath the line with links made to place value chart.</p> $\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ 1 \quad 1 \end{array}$ <p>Years 4, 5 and 6 use the same written method to add increasingly larger numbers (4 and 5 digits). They become more independent in using their place value knowledge to set out their own calculations.</p>

Subtraction Calculation Guidance

Key Vocabulary: take away, less than, the difference, subtract, minus, fewer, decrease

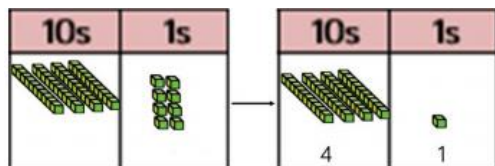
Curriculum Statements

EYFS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
<ul style="list-style-type: none"> ► Say which number is one less than a given number. ► Use quantities and objects to subtract two single digit numbers and count back to find the answer 	<ul style="list-style-type: none"> ► Represent and use number bonds and related subtraction facts within 20. ► Subtract one-digit and two-digit numbers to 20, including 0. ► Solve one step problems using concrete and pictorial representations and missing number problems 	<ul style="list-style-type: none"> ► Recall and use facts to 20 fluently. ► Derive & use related facts to 100. ► Subtract: two-digit number and 1s; two-digit number and 10s; 2 two-digit numbers. ► Show that subtraction of two numbers cannot be done in any order 	<ul style="list-style-type: none"> ► Subtract: three-digit number and 1s; three-digit number and 10s; three-digit number and 100s. ► Subtract three-digit numbers using written methods of columnar subtraction where appropriate ► Add amounts of money to give change 	<ul style="list-style-type: none"> ► Subtract four-digit numbers using formal written methods of columnar subtraction ► Solve addition two-step problems in contexts, choosing which operations and methods to use and why. 	<ul style="list-style-type: none"> ► Subtract numbers with more than four digits using formal written methods of columnar subtraction. ► Solve subtraction multi-step problems in context deciding which operations and methods to use and why. 	<ul style="list-style-type: none"> ► Subtract using simple formulae. ► Express missing number problems algebraically. ► Find pairs of numbers that satisfy an equation with two unknowns. ► Enumerate possibilities of combinations of 2 variables

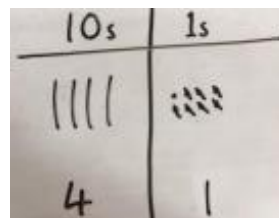
	CONCRETE	PICTORIAL	ABSTRACT
EYFS	<p>Physically taking away & removing objects. Ten frames, Numicon, cubes, other items such as beanbags.</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. A bar model can also be used.</p> 	<p>$4 - 3 =$</p> 
YEAR 1	<p>Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.</p> 	<p>Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.</p> 	<p>Find the difference between 8 and 5</p> <p>$8 - 5$, the difference =</p> <p>Children to explore numbers which have the same difference e.g. $8 - 5$ is the same as $9 - 6$ and $7 - 4$</p>
	<p>Making 10 using ten frames $14 - 5$</p> 	<p>Children to present the ten frames pictorially and discuss what they did to make 10.</p> 	<p>Children to show how they can make 10 using partitioning</p> $14 - 5 = 9$  <p>$14 - 4 = 10$ $10 - 1 = 9$</p>

YEAR 2

Column subtraction using base 10
48 - 7



Children represent the base 10 pictorially

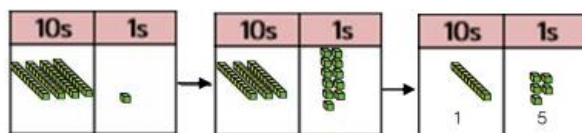


Column method or children can count back 7

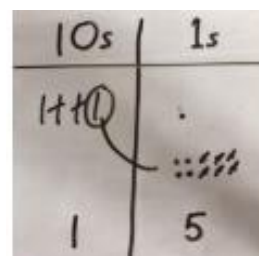
$$\begin{array}{r} 48 \\ - 7 \\ \hline 41 \end{array}$$

YEAR 3

Column method using base 10 and having to exchange. 41 - 26



Children to represent the base 10 pictorially.



Formal column method - Children must understand that when they have exchanged the 10 they still have 41 because $41 = 30 + 11$.

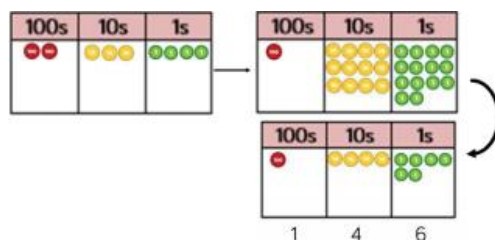
$$\begin{array}{r} 41 \\ - 26 \\ \hline 15 \end{array}$$

YEAR 4

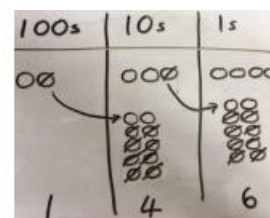
YEAR 5

YEAR 6

Column method using place value counters.
234 - 88



Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal column method. Children must understand what has happened when they have crossed out digits.

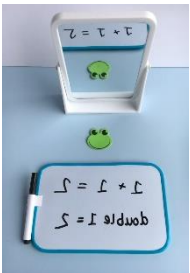
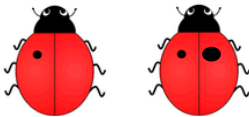
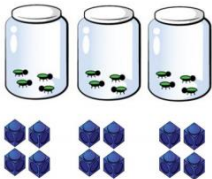
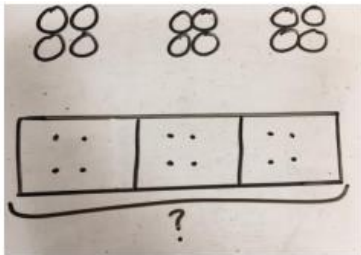

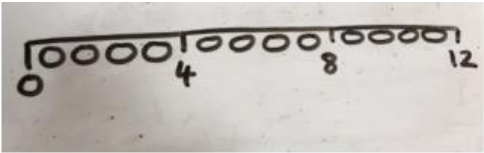
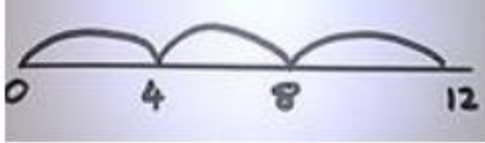
$$\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$$

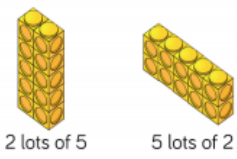
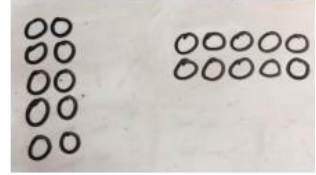
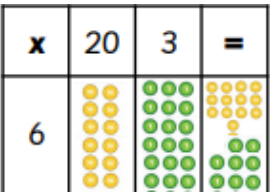
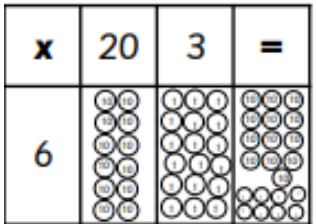
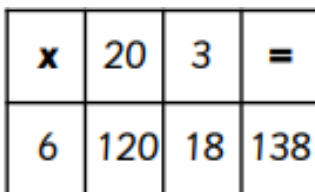
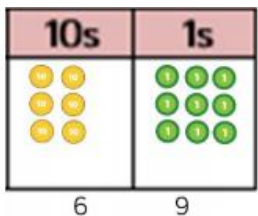
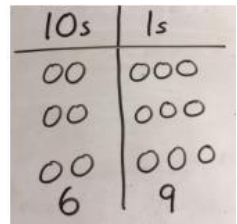
Multiplication Calculation Guidance

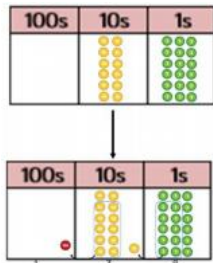
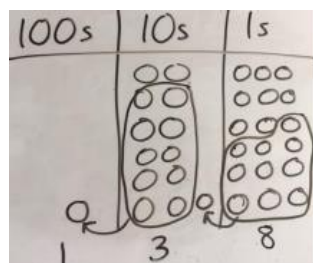
Key vocabulary: multiply, double, times, multiplied by, the product of, groups of, lots of, equal groups

Curriculum Statements

EYFS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
<ul style="list-style-type: none"> ► Solve problems by doubling. 	<ul style="list-style-type: none"> ► Solve one - step problems involving multiplication, by calculating the answers by using concrete objects, pictorial representations and arrays with the support of the teacher. 	<ul style="list-style-type: none"> ► Recall and use multiplication facts for 2, 5 & 10 multiplication tables, including recognising odd and even numbers. ► Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication and equals signs. 	<ul style="list-style-type: none"> ► Recall and use multiplication facts for 3, 4 and 8 multiplication tables. <ul style="list-style-type: none"> ► Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers and one-digit, using mental and progressing to formal written methods. 	<ul style="list-style-type: none"> ► Recall multiplication facts for tables to 12 x 12. ► Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; multiplying together 3 numbers. <ul style="list-style-type: none"> ► Multiply two-digit and three-digit numbers by a one-digit number 	<ul style="list-style-type: none"> ► Multiply numbers up to 4- digits by a 1- or 2-digit number using formal written method including long multiplication for 2-digit numbers. 	<ul style="list-style-type: none"> ► Multiply multi-digit numbers up to 4 digits by a two-digit whole number using formal written method of long multiplication. <ul style="list-style-type: none"> ► Multiply 1-digit number with up to 2 decimal places by whole numbers.

	CONCRETE	PICTORIAL	ABSTRACT
EYFS	<p>Doubling - children use a range of objects such as Numicon, dominoes and playdough as well as mirrors and symmetry to understand doubling.</p> 	<p>Children use images such as ladybirds or butterflies to double the number on one wing by drawing on the other side and counting. $1 + 1 = 2$</p> 	<p>$6 + 6 =$ Double 6 =</p>
YEAR 1	<p>Repeated grouping/repeated addition 3×4 $4 + 4 + 4$ There are 3 equal groups, with 4 in each group.</p> 	<p>Children to represent the practical resources in a picture or use a bar model.</p> 	<p>$3 \times 4 = 12$ $4 + 4 + 4 = 12$</p>
YEAR 2	<p>Number lines to show repeated groups 3×4</p> 	<p>Represent this pictorially alongside a number line e.g.:</p> 	<p>Abstract number line showing three jumps of four. $3 \times 4 = 12$</p> 

	<p>Use arrays to illustrate commutativity - counters and other objects can also be used.</p>  <p>$2 \times 5 = 5 \times 2$</p>	<p>Children to represent the arrays pictorially</p> 	<p>Children to be able to use an array to write a range of calculations e.g.</p> <p>$10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$</p>
<p>YEAR 3 YEAR 4</p>	<p>The grid method using partitioning - Using place value counters or base 10 in a grid method format</p> 	<p>Visually represent place value counters or base ten by drawing these and show any exchanges made.</p> 	<p>Children should be confident in partitioning numbers into H, T and O.</p> 
	<p>Formal column method with place value counters (base 10 can also be used.) 3×23</p> 	<p>Children to represent the counters pictorially</p> 	<p>Children to record what it is they are doing to show understanding.</p> <p> 3×23 $20 \quad 3$ </p> <p> $3 \times 20 = 60$ $3 \times 3 = 9$ $60 + 9 = 69$ </p> <p> 23 $\times 3$ $\hline 69$ </p>



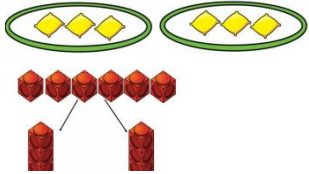
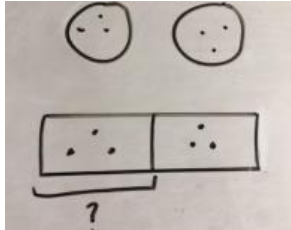
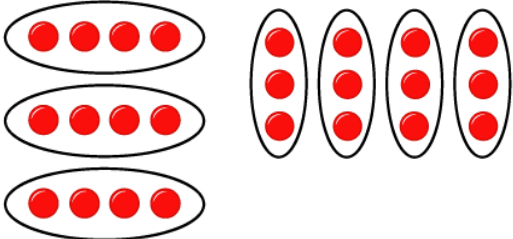
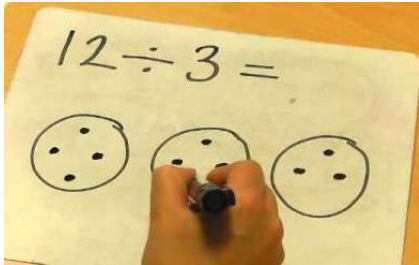

	<p>Formal column method using place value counters (with exchanging)</p> <p>6×23</p> 	<p>Children to represent the counters/base 10, pictorially showing any exchanges.</p> 	<p>Formal written method:</p> $\begin{array}{r} 6 \times 23 = \\ 23 \\ \times 6 \\ \hline 138 \\ 11 \end{array}$
<p>YEAR 5</p> <p>YEAR 6</p>	<p>When children start to multiply 3-digits \times 3-digits and 4-digits \times 2-digits etc., they should be confident with the abstract:</p> <p>To get 744 children have solved 6×124.</p> <p>To get 2480 they have solved 20×124.</p>	<p>Formal written method (long multiplication)</p> $\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ 11 \end{array}$ <p>Answer: 3224</p>	

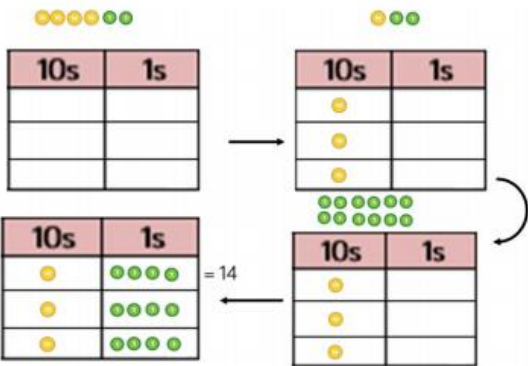
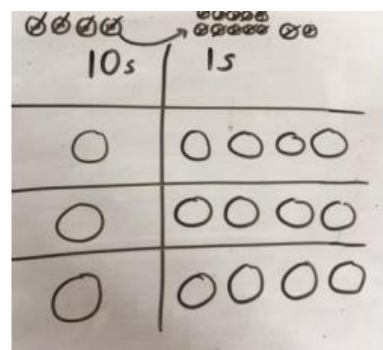
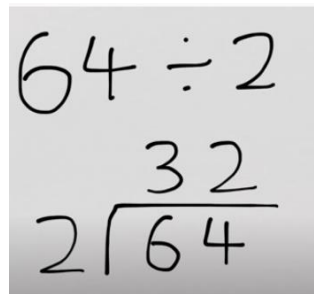
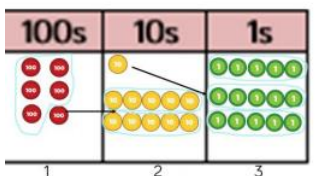
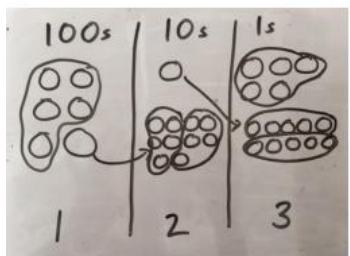
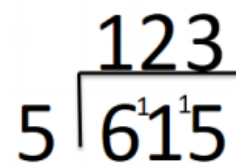
Division Calculation Guidance

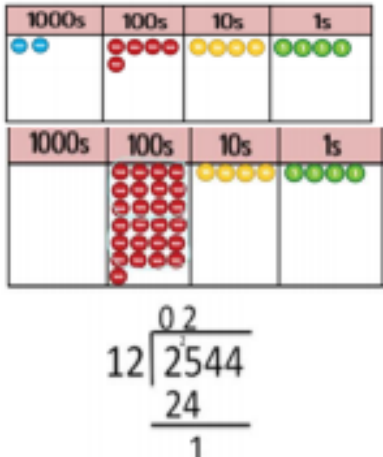
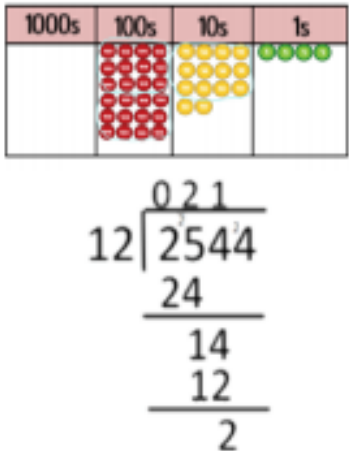
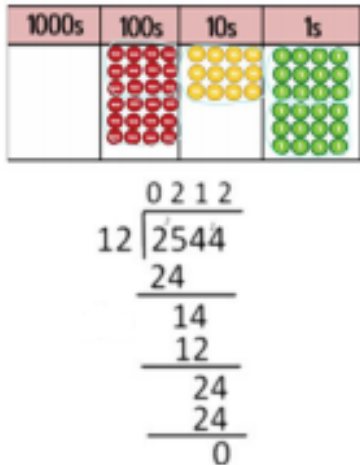
Key Vocabulary: share, group, divide, divided by, half

Curriculum Statements

EYFS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
<p>► Solve problems by sharing and halving.</p>	<p>► Solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.</p>	<p>► Recall and use division facts for 2, 5 & 10 multiplication tables, including recognising odd and even numbers.</p> <p>► Calculate mathematical statements for division within the multiplication tables and write them using the division and equals signs.</p>	<p>► Recall and use division facts for 3, 4 and 8 multiplication tables.</p> <p>► Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers one-digit, using mental and progressing to formal written methods.</p>	<p>► Recall division facts for tables to 12 x 12.</p> <p>► Use place value, known and derived facts to multiply and divide mentally, including: dividing by 1.</p> <p>► Practise becoming fluent in the method of short division with exact answers.</p>	<p>► Divide numbers up to 4 digits by 1 digit using formal written method of short division and interpret remainders appropriately for the context.</p>	<p>► Divide numbers up to 4 digits by a two-digit whole number using formal written method of long division, and interpret remainders as whole number remainders, fractions or by rounding, as appropriate for context.</p> <p>► Divide numbers up to 4 digits by a two-digit number using formal written method of short division where appropriate. Interpreting remainders according to the context.</p>

	CONCRETE	PICTORIAL	ABSTRACT
EYFS	<p>Sharing and halving - children use a number of objects to sort and share into 2 equal groups. How many are in one half?</p> 	<p>Children use drawing to represent the two equal groups pictorially.</p>  <p>Half of 10 is _____</p>	<p>Half of 10 = 10 shared by two =</p>
YEAR 1	<p>Sharing using a range of objects. $6 \div 2$</p> 	<p>Children represent the sharing pictorially</p> 	<p>$6 \div 2 = 3$</p> <p>Children should also be encouraged to use their 2 times tables facts</p>
YEAR 2	<p>Grouping using arrays – children use objects such as counters or cubes and share into equal groups. $12 \div 4 = 3$</p>  <p>$12 \div 3 = 4$</p>	<p>Children pictorially represent the counters as dots and share into equal groups.</p> 	<p>Children begin to understand the commutativity of multiplication and division.</p>  <p>I have ___ cubes altogether. There are ___ in each group. There are ___ groups.</p> <p>$\square \div \square = \square$ $\square \times \square = \square$</p>

<p>YEAR 3 YEAR 4</p>	<p>Sharing using place value counters $42 \div 3 = 14$</p> 	<p>Children to represent the place value counters pictorially.</p> 	<p>Short division (with no remainders or exchanges)</p> 
<p>YEAR 3 (S+) YEAR 4 YEAR 5</p>	<p>Short division using place value counters to group.</p> <p>$615 \div 5$</p>  <ol style="list-style-type: none"> 1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones? 	<p>Represent the place value counters pictorially.</p> 	<p>Children to solve the calculation using the short division scaffold (bus stop method).</p>  <p>Year 4 (S+) and Year 5 use this written method to solve division problems involving remainders.</p>

	LONG DIVISION USING PLACE VALUE COUNTERS AND WRITTEN METHOD e.g. $2544 \div 12 =$		
YEAR 6	<p>STEP 1:</p>  <p>We can't group 2 thousands into groups of 12 so we must exchange them. We can group 24 hundreds into groups of 12 which leaves 1 hundred.</p>	<p>STEP 2:</p>  <p>After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12 which leaves 2 tens.</p>	<p>STEP 3:</p>  <p>After exchanging the two tens, we have 24 ones. We can group 24 ones into 2 groups of 12, which leaves no remainders.</p>