
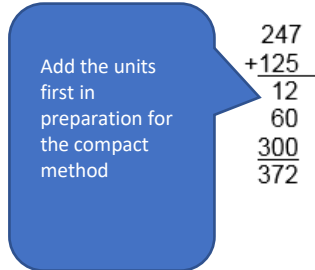

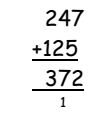


# Addition

Calculation progression through the primary years

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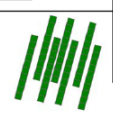
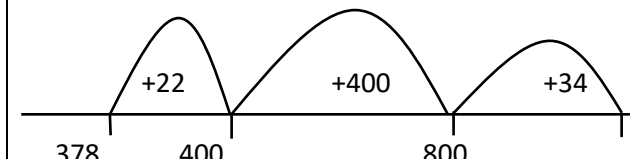
	Branches	Milestone 2	Method	Model/Examples
		Year 3 National curriculum		
Addition Year 3	Number Bonds		Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.	Continue to use apparatus to support children to visualise number facts. Use the bar model to represent calculations and problems.
	Mental Calculations	add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * a three-digit number and hundreds	<b>Partition into hundreds, tens and ones</b> Partition both numbers and recombine. Count on by partitioning the second number only e.g. $247 + 125 = 247 + 100 + 20 + 5$ $= 347 + 20 + 5$ $= 367 + 5$ $= 372$	 $\begin{array}{r} 200 + 40 + 7 \\ 100 + 20 + 5 \\ 300 + 60 + 12 = 372 \end{array}$
	Written Methods	add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10.	
	Inverse operations, estimating and checking answers	estimate the answer to a calculation and use inverse operations to check answers	<b>Towards a Written Method</b> Introduce expanded column addition modelled with place value counters (Apparatus could be used for those who need a less abstract representation)	
	Problem Solving	solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	Leading to children understanding the exchange between tens and ones. Some children may begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.	

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# Subtraction

Calculation progression through the primary years

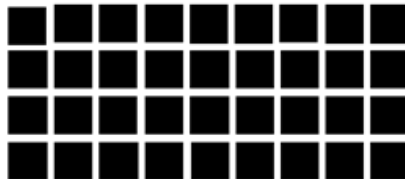
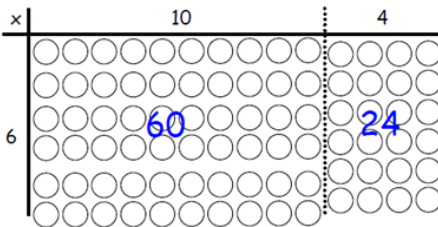
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	Branches	Milestone 2	Method	Model/Examples
		Year 3 National curriculum		
Subtraction Year 3	Number Bonds		<b>Missing number problems</b>  <b>Mental methods</b> should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving (see Y1 and Y2). Children should make choices about whether to use complementary addition or counting back, depending on the numbers involved.	e.g. $\square = 43 - 27$ ; $145 - \square = 138$ ; $274 - 30 = \square$ ; $245 - \square = 195$ ; $532 - 200 = \square$ ; $364 - 153 = \square$  <div> <div> <b>STEP 1:</b> introduce this method with examples where no exchanging is required.               <math display="block">\begin{array}{r} 89 - 35 = 54 \\ 80 + 9 \\ - 30 + 5 \\ \hline 50 + 4 \end{array}</math> </div> <div> <b>STEP 2:</b> introduce 'exchanging' through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.               <math display="block">\begin{array}{r} 72 - 47 \\ -47 \\ \hline 25 \end{array}</math> </div> <div>  <p>Before subtracting '7' from the 72 blocks, they will need to exchange a row of 10 for ten units. Then subtract 7, and subtract 4 tens.</p> </div> <div> <p>When learning to 'exchange', explore 'partitioning in different ways' so that pupils understand that when you exchange, the value is the same ie <math>72 = 70 + 2 = 60 + 12 = 50 + 22</math> etc. Emphasise that the value hasn't changed, have just partitioned it in a different way.</p> </div> </div>
	Mental Calculations	add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * a three-digit number and hundreds		
	Written Methods	add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	<b>Written methods (progressing to 3-digits)</b> Introduce expanded column subtraction with no decomposition, modelled with place value counters (Apparatus could be used for those who need a less abstract representation)  For some children this will lead to exchanging, modelled using apparatus.   A number line and expanded column method may be compared next to each other.	<b>834 - 378 =</b> The library owns 834 books. 378 are out on loan. How many are on the shelves?   $\begin{array}{r} 834 \\ -378 \\ \hline 456 \end{array}$
	Inverse operations, estimating and checking answers	estimate the answer to a calculation and use inverse operations to check answers		
	Problem Solving	solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction		

# Multiplication

Calculation progression through the primary years

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Multiplication Year 3	Branches	Milestone 2 Year 3	Method	Models/Examples
	Multiplication and division facts	count from 0 in multiples of 4, 8, 50 and 100 (copied from Number and Place Value	Missing number problems  <b>Mental methods</b> Doubling 2 digit numbers using partitioning Demonstrating multiplication on a number line – jumping in larger groups of amounts 13 x 4 = 10 groups 4 = 3 groups of 4	Continue with a range of equations as in Year 2 but with appropriate numbers.  Use jottings to record method 14 x 4 = 10 x 4 = 40 4 x 4 = 16 40 + 16 = 56    9 x 4 = 36  Eg. 23 x 8 = 184
		recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables		
	Mental Calculations	write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Written Methods)	<b>Written methods (progressing to 2d x 1d)</b> Developing written methods using understanding of visual images	  160 + 24 = 184
	Written Methods	write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Mental Methods)		
	Properties of numbers: Multiples, Factors, Prime, Square, cube numbers		Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format	
	Order of Operations			
	Inverse operations, estimating and checking answers	estimate the answer to a calculation and use inverse operations to check answers (copied from Addition and Subtraction)		
	Problem Solving	solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects	Give children opportunities for children to explore this and deepen understanding using apparatus and place value counters	

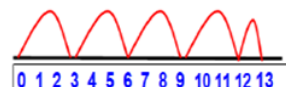
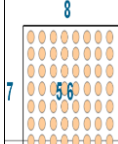
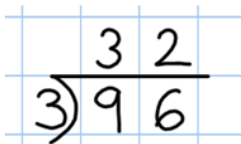
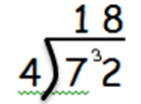
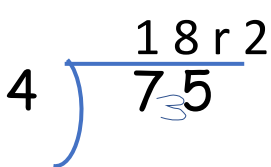
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# Division

Calculation progression through the primary years

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# Division Year 3

	Branches	Milestone 2	Method	Models/Examples
		Year 3		
	Multiplication and division facts	count from 0 in multiples of 4, 8, 50 and 100 (copied from Number and Place Value)	<p><b><math>\div</math> = signs and missing numbers</b> Continue using a range of equations as in year 2 but with appropriate numbers.</p> <p><b>Grouping</b> How many 6's are in 30?</p> <p><b>Becoming more efficient using a numberline</b> Children need to be able to partition the dividend in different ways.</p> <p><b>Short Division</b> Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., short division for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array.</p> <p><b>Remainders</b> <b><math>49 \div 4 = 12 \text{ r}1</math></b> Sharing – 49 shared between 4. How many left over? Grouping – How many 4s make 49. How many are left over? Place value counters can be used to support children apply their knowledge of grouping.</p>	<p>Step 1 <b><math>13 \div 3 = 4 \text{ r}1</math></b></p> <p>+3 +3 +3 +3 r1</p>  <p>Step 2 Short division: <b>Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).</b></p>  <p><math>56 \div 7 = 8</math> <math>56 \div 8 = 7</math></p> <p>Start by introducing the layout of short division by comparing it to an array.</p>  <p>Remind children of correct place value, that 96 is equal to 90 and 6, so: - How many 3's in 90? = 30 - How many 3's in 6? = 2</p> <p>Step 3 Short division: including working with remainders</p>  
		recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables		
	Mental Calculations	write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Written Methods)		
	Written Methods	write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Mental Methods)		
	Properties of numbers: Multiples, Factors, Prime, Square, cube numbers			
	Order of Operations			
	Inverse operations, estimating and checking answers	<i>estimate the answer to a calculation and use inverse operations to check answers</i> (copied from Addition and Subtraction)		
	Problem Solving	solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects		