

Long Marston VA C of E Primary School Calculation Policy

Introduction

This policy outlines the teaching, organisation and management of Calculation taught and learnt at Long Marston VA C of E Primary School.

Calculation is the teaching of Addition and Subtraction, Multiplication and Division.

The policy has been drawn up as a result of staff discussion and has the full agreement of the Governing Body. The implementation of this policy is the responsibility of all teaching staff. The responsibility for monitoring and review rests with the Mathematics subject leader and Senior Leadership Team.

Rationale

At Long Marston we believe that a clear progression in calculation will support the teaching and learning of maths throughout the whole school.

This policy will show the progression in methods of calculation and examples to support the steps. Mental methods are taught first and this will lead into written methods. Children are taught a variety of ways both mental (first) and written methods to allow them to choose what works for them. All methods of calculations should be taught with understanding rather than learnt by rote. Each method of calculation should be applied into real life contexts.

REASONS FOR USING MENTAL METHODS

Oral and mental work in mathematics is essential, particularly so in calculation. Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. Ongoing oral and mental work provides practice and consolidation of these ideas.

More formal written methods should follow **only** when the child is able to use a wide range of mental calculation strategies.

REASONS FOR USING WRITTEN METHODS

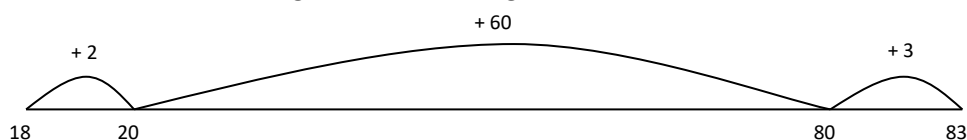
- To aid mental calculation by writing down some of the numbers and answers involved
- To make clear a mental procedure for the pupil
- To help communicate methods and solutions
- To provide a record of work to be done
- To aid calculation when the problem is too difficult to be done mentally
- To develop and refine a set of rules for calculation

* Over – Reliance on written methods should be discouraged to avoid “losing” mental skills.

We have developed a consistent approach to the teaching of written calculation methods. This will establish continuity and progression throughout the school.

Mental methods will be established. These will be based on a solid understanding of place value in number and will include the following:

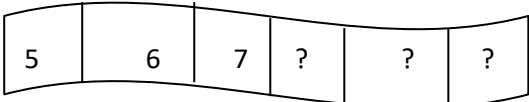
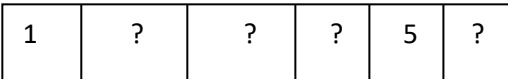
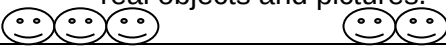
- i. Remembering number facts and recalling them without hesitation
e.g. pairs of numbers which make 10
Doubles & halves to 20
- ii. Using known facts to calculate unknown facts
e.g. $6 + 6 = 12$ therefore $6 + 7 = 13$
 $24 + 10 = 34$ therefore $24 + 9 = 33$
- iii. Understanding and using relationships between addition & subtraction to find answers and check results
e.g. $14 + 6 = 20$ therefore $20 - 6 = 14$
- iv. Having a repertoire of mental strategies to solve calculations
e.g. doubles / near doubles
bridging 10 / bridging 20
adding 9 by +10 & -1
- v. Making use of informal jottings such as blank number lines to assist in calculations with larger numbers *e.g. $83 - 18 = 65$*

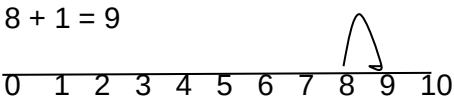
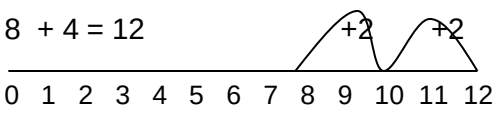
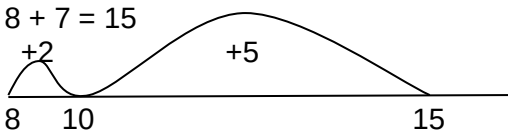
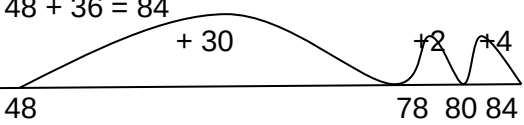
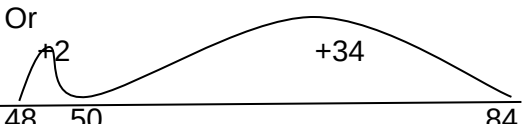


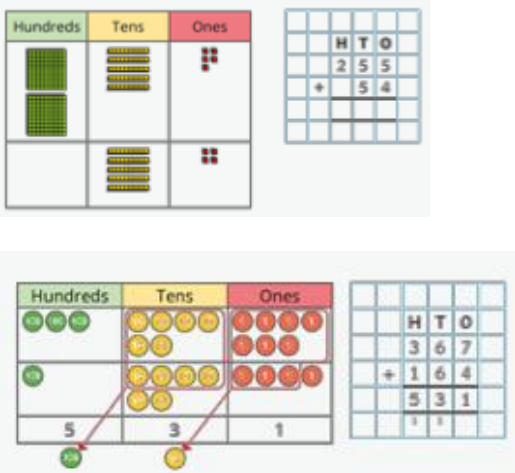
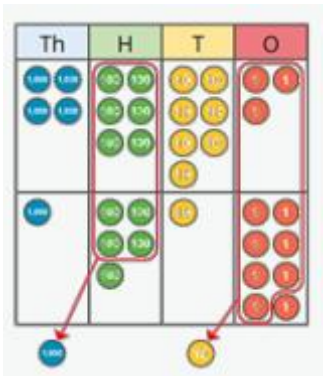
- vi. Solving one-step word problems (either mentally or with jottings) by identifying which operation to use, drawing upon their knowledge of number bonds and explaining their reasoning
- vii. Beginning to present calculations in a horizontal format and explain mental steps using numbers, symbols or words
- viii. Learn to estimate/approximate first *e.g. $29 + 30$ (round up to nearest 10, the answer will be near to 60).*

Place value will be taught mentally first from Reception progressing to number lines (to 20 as appropriate) and 100 squares in Years 1 and 2. The empty number line will then be introduced to aid calculations. Subtraction will be taught by counting on and counting back depending on the numbers.

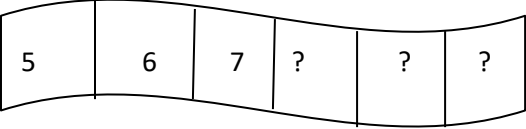
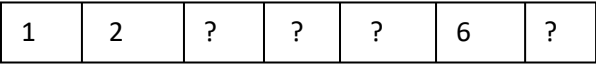
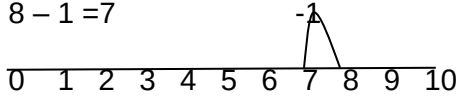
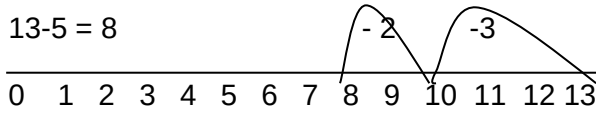
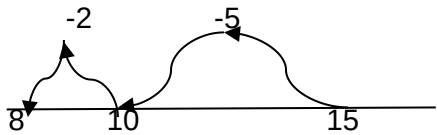
Written methods for addition

Phase 1 Develop secure one to one correspondence and understanding of addition.	- Count accurately 0 – 10 - Recognise and write numerals 1 – 10  What is the number before 5? And after 5? What numbers are between 1 and 5?  - Count and add together sets of real objects and pictures. 	Key Vocabulary Add, more, and, make, sum, total, altogether, equals
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Phase 2 The number line and 100 square The number line helps children to move from using concrete objects. Children begin to split a number to add to the nearest multiple of 10 and then count on. The 100 square supports children's understanding when adding 10 to any number the units stay the same and the tens go up. Eventually this will be done mentally.	To use a number line to add two or more numbers together. $8 + 1 = 9$  To be able to add through 10. $8 + 4 = 12$  100 Square To be able to add 10 to any number up to 100 using a 100 square by initially counting on 10 or moving down to the square below and recognising changing patterns of tens digit. $9 + 10 = 10 + 9 = 19$ To be able to add multiples of 10 to any number up to 100 using a 100 square. $34 + 40 = 74$	Key Vocabulary Add, more, count on, plus, sum, total, altogether, partition, how many. Multiple of 10, number line, 100 square
Phase 3 The empty number line The mental methods that lead to column addition generally involve partitioning, e.g. adding tens and ones separately, often starting with the tens. Children need to be able to partition numbers in ways other than into tens and ones to help them make multiples of ten by adding in steps. The empty number line helps to record the steps on the way to calculating the total.	Steps in addition can be recorded on an empty number line. The steps often bridge through a multiple of 10. $8 + 7 = 15$  To be able to add 2 two digit numbers on an empty number line. $48 + 36 = 84$  Or 	Key Vocabulary As above

Phase 4 Partitioning The next stage is to record mental methods using partitioning. Add the ones and then the tens to form partial sums and then add these partial sums. Partitioning both numbers into tens and ones mirrors the column method where units are placed under ones and tens under tens. This also links to mental methods. There are ... ones, so I do/do not need to make an exchange. There are ... tens, so I do/do not need to make an exchange. ... ones = ... ten and ... ones. ... tens = ... hundred and ... tens.		Key Vocabulary As above column, addition, tens, boundary Teaching Point Ensure correct use of the = sign
Phase 5 Column method In this method, recording is reduced further. Carry digits are recorded below the line, using words 'carry ten' or carry one hundred', not carry one'. Later, extend to adding three two-digit numbers, two three-digit numbers and numbers with different numbers of digits.	$\begin{array}{r} 47 \\ + 76 \\ \hline 11 \\ 123 \end{array}$ $\begin{array}{r} 258 \\ + 87 \\ \hline 11 \\ 345 \end{array}$ $\begin{array}{r} 366 \\ + 458 \\ \hline 11 \\ 824 \end{array}$ Column addition remains efficient when used with larger numbers and decimals. Once learned, the method is quick and reliable. 	Key Vocabulary As above Carry
Phase 6 Column method expanded to decimals In this phase the standard method is expanded to include the use of decimals.	$45.2 + 26.59 =$ $\begin{array}{r} 45.20 \\ + 26.59 \\ \hline 71.79 \end{array}$ $\begin{array}{r} 45.24 \\ + 26.59 \\ \hline 11 \\ 71.83 \end{array}$	Key Vocabulary As above Units boundary, tenths boundary, hundredths Boundary.

Written methods for subtraction

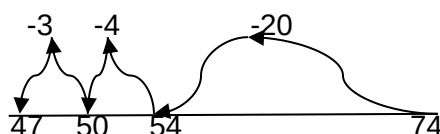
Phase 1 Develop secure one – one correspondence and understanding of subtraction.	Count accurately forwards and backwards from 1 – 10 Recognise and write numerals 1 -10   What is the number before 6? And after 6? What numbers are between 1 and 6? Count and subtract sets of real objects and pictures.	Key Vocabulary subtraction, leave, how many are left/left over?, how many have gone?, one less two less... ten less... how many fewer is... than...? smaller
Phase 2 Number line and 100 square	To be able to subtract/ take away one less on a number line. $8 - 1 = 7$  To be able to subtract through 10. $13 - 5 = 8$  To be able to subtract 10 from any number up to 100 using a 100 square. $34 - 10 = 24$ To be able to subtract multiples of 10 from any number up to 100 using a 100 square. $84 - 40 = 44$ (100 square)	Key Vocabulary how much more is...? -, subtract, minus leave how many are left/left over? how many are gone? one less, two less, ten less... how many fewer is... than...? how much less is...? difference between half, halve
Phase 3 Using the empty number line The empty number line helps to record or explain the steps in mental subtraction. A calculation like 74-27 can be recorded by counting back 27 from 74 to reach 47. The empty number line is also a	Steps in subtraction can be recorded on a number line. The steps often bridge through a multiple of 10. $15 - 7 = 8$ 	Key Vocabulary -, subtract, minus leave, how many are left/left over? one less, two less... ten less... one hundred

useful way of modelling processes such as bridging through a multiple of ten.

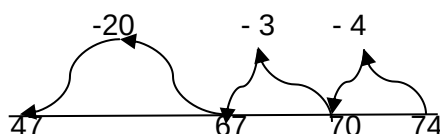
The steps can also be recorded by counting up from the smaller to the larger number to find the difference, for example by counting up from 27 to 74 in steps totalling 47.

With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations, such as $57 - 12$, $86 - 77$ or $43 - 28$.

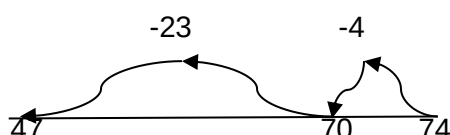
$74 - 27 = 47$ worked by counting back:



The steps may be recorded in a different order.

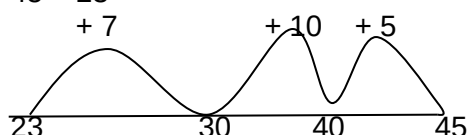


Or combined



Subtract a 2 two digit number by finding the difference through counting on an empty number line.

$$45 - 23 =$$



$$7 + 10 + 5 = 22$$

less
how many
fewer is... than
...?
how much less
is...?
difference
between
half, halve

Phase 4 Regrouping

Our children are encouraged to use regrouping when they have a secure understanding of place value in relation to subtraction.

$$\begin{array}{r} 473 \\ - 389 \\ \hline 84 \end{array}$$

$$\begin{array}{r} 61 \\ 4\cancel{7}3 \\ - 389 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 3 16 1 \\ \cancel{4}\cancel{7}3 \\ - 389 \\ \hline 84 \end{array}$$



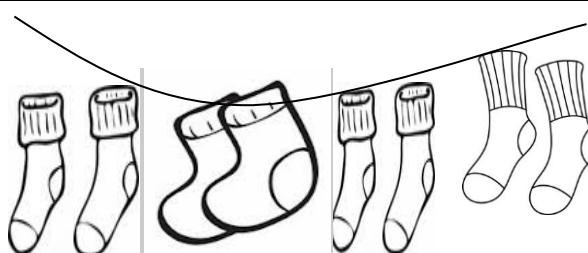
Written Methods for Multiplication**Phase 1 Hands on experience**

Initially children put objects into groups/ sets.

Solve multiplication through repeated addition.

To use arrays to solve multiplication problems.

Children begin to identify patterns within multiplications (e.g. numbers always ends with a 0,2,4,6,8, in the 2X table) and between multiplications (4X table is double the 2X table). Also $5 \times 9 = 9 \times 5$ and $9 \times 4 = (10 \times 4) - 4$ and $12 \times 6 = 11 \times 6 + 6$



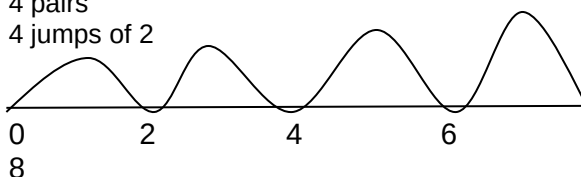
$$2 + 2 + 2 + 2 = 8$$

$$2 \times 4 = 8$$

2 multiplied by 4

4 pairs

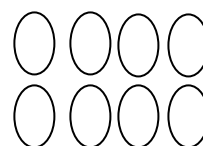
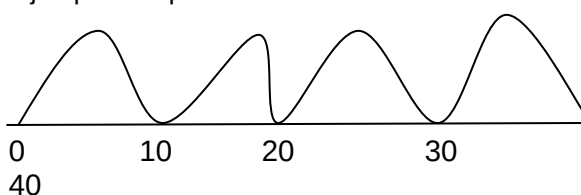
4 jumps of 2



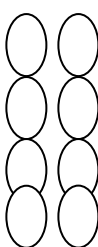
$$10p + 10p + 10p + 10p = 40p$$

$$10p \times 4 = 40p$$

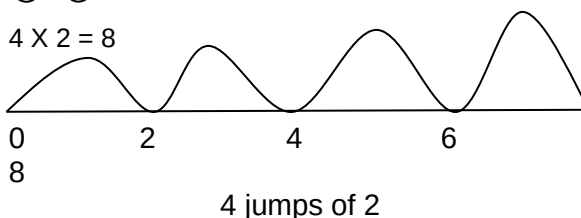
4 jumps of 10p



$$2 \times 4 = 8$$



$$4 \times 2 = 8$$



To multiply by 4

$$17 \times 4 =$$

$$17 \times 2 \times 2 = 32 \times 2 = 68$$

To multiply by 5

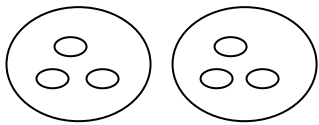
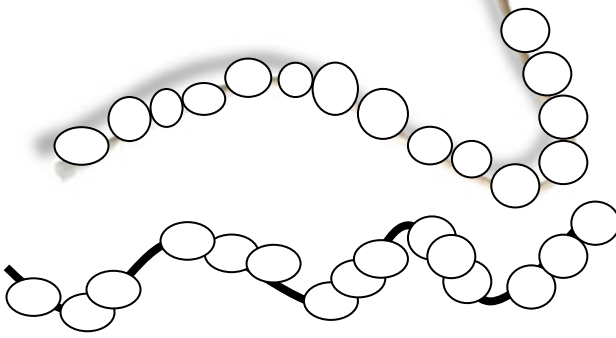
$$14 \times 5 =$$

Phase 2 Mental multiplication using partitioning Mental methods for multiplying TO x O can be based on the distributive law of multiplication over addition. This allows the tens and ones to be multiplied separately to form partial products. These are then added to find the total product. Either the tens or the ones can be multiplied first but it is more common to start with the tens.	$(14 \times 10)/2 = 140/2 = 70$ Informal recordings might be: 43×6 $\begin{array}{r} 43 \\ \downarrow \\ \begin{array}{r} 40 \quad + \quad 3 \\ \downarrow \quad \downarrow \\ 240 \quad + \quad 18 = 258 \end{array} \end{array}$ $\times 6$ Also record mental multiplication using partitioning: $14 \times 3 = (10 + 4) \times 3$ $= (10 \times 3) + (4 \times 3) = 30 + 12 = 42$ $43 \times 6 = (40 + 3) \times 6$ $= (40 \times 6) + (3 \times 6) = 240 + 18 = 258$ Note: These methods are based on the distributive law. Children should be introduced to the principle of its law (not its name) in years 2 and 3, for example when they use their knowledge of the 2, 5 and 10 times-tables to work out multiples of 7: $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$ $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \dots \bigcirc \bigcirc$ $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$ $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \dots \bigcirc \bigcirc$ $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$ $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \dots \bigcirc \bigcirc$ $7 \times 3 = (5 + 2) \times 3 = (5 \times 3) + (2 \times 3) = 15 + 6 = 21$																												
Phase 3a: Short multiplication The grid method is taught here for TO x O.	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>x</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table> $12 \times 3 = 36$ <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>x</td> <td>10</td> <td>2</td> <td></td> </tr> <tr> <td>3</td> <td>30</td> <td>6</td> <td>= 36</td> </tr> </table>	x																				x	10	2		3	30	6	= 36
x																													
x	10	2																											
3	30	6	= 36																										
Phase 3b: Short multiplication The recording is reduced further, with carried digits recorded below the line. If, after practice, children cannot use the compact method without making errors, they should return to the expanded format of phase 4.	$\begin{array}{r} 38 \\ \times 7 \\ \hline 5 \\ \hline 266 \end{array}$ The steps here involve adding 210 and 50 mentally with only the 5 in the 50 recorded. This highlights the need for children to be able to add a multiple of 10 to a two digit or three-digit number mentally before they reach this stage.																												

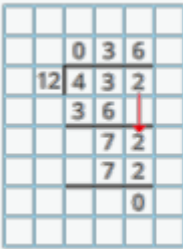
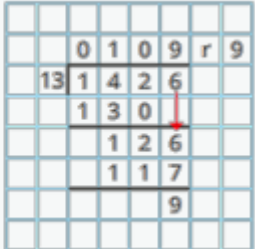
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Phase 4: Two digit by two digit products																					
Extend to TO x TO, asking children to estimate first	56 x 27 is approximately 60 x 30 = 1800																				
Start with the grid method. The partial products in each row are added, and then the two sums at the end of each row are added to find the total product.	<table><tr><td>X</td><td>20</td><td>7</td><td></td></tr><tr><td>50</td><td>1000</td><td>350</td><td>1350</td></tr><tr><td>6</td><td>120</td><td>42</td><td>162</td></tr><tr><td></td><td></td><td></td><td>1512</td></tr></table>	X	20	7		50	1000	350	1350	6	120	42	162				1512				
X	20	7																			
50	1000	350	1350																		
6	120	42	162																		
			1512																		
As in the grid method for TO x O in phase 4, the first column can become an extra top row as a stepping stone to the method below.	<table><tr><td></td><td>50</td><td>6</td><td>1</td></tr><tr><td>X</td><td>20</td><td>7</td><td></td></tr><tr><td></td><td>1000</td><td>350</td><td>1350</td></tr><tr><td></td><td>120</td><td>42</td><td>162</td></tr><tr><td></td><td></td><td></td><td>1512</td></tr></table>		50	6	1	X	20	7			1000	350	1350		120	42	162				1512
	50	6	1																		
X	20	7																			
	1000	350	1350																		
	120	42	162																		
			1512																		
Phase 5 Long Multiplication																					
Write the larger number above the smaller number lining up the tens and ones.	$\begin{array}{r} 756 \\ \times 32 \\ \hline \end{array}$																				
Multiply the ones of the bottom number by each part of the top number (ones, tens, hundreds).	$\begin{array}{r} 1 \\ 756 \\ \times 32 \\ \hline 2 \end{array}$																				
Multiply the tens of the bottom number by each part of the top number (ones, tens, hundreds).	$\begin{array}{r} 11 \\ 756 \\ \times 32 \\ \hline 12 \end{array}$																				
Add the two answers together.	$\begin{array}{r} 11 \\ 756 \\ \times 32 \\ \hline 1512 \end{array}$ $\begin{array}{r} 756 \\ \times 32 \\ \hline 1512 \\ 0 \end{array}$ $\begin{array}{r} 1 \\ 756 \\ \times 32 \\ \hline 1512 \\ 80 \end{array}$ $\begin{array}{r} 11 \\ 756 \\ \times 32 \\ \hline 1512 \\ 680 \end{array}$ $\begin{array}{r} 11 \\ 756 \\ \times 32 \\ \hline 1512 \\ 22680 \end{array}$																				

	$ \begin{array}{r} 756 \\ \times 32 \\ \hline 1512 \\ +22680 \\ \hline 24192 \end{array} $
Multiplying decimals When multiplying decimals treat it as a short or long multiplication. Then count the decimal places for both numbers and add the decimal point into the final number.	$ \begin{array}{r} 3.2 \\ \times 6 \\ \hline 19.2 \end{array} $ $ \begin{array}{r} 3.26 \\ \times 1.2 \\ \hline 652 \\ 3260 \\ \hline 3.912 \end{array} $ $ \begin{array}{r} 2.25 \\ \times 3.2 \\ \hline 440 \\ 6750 \\ \hline 7.190 \end{array} $ Answer is 7.19

Written methods for division

Phase 1	To half numbers to 10/20 – practically and mentally. To be able to divide practically by sharing. 6 eggs shared between 2 nests = 3   
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To divide on a number line initially with no remainders and later with remainders.	0 15 5 hops in 15. How big is each hop? $15 \div 5 = 3$ 15 shared between 5 Next Steps: Using the inverse of times table facts Eg: $9 \times 5 = 45$ therefore $45 \div 5 = 9$ and $45 \div 9 = 5$
Phase 2: Mental division using partitioning Mental methods for dividing $TO \div O$ can be based on partitioning and on the distributive law of division over addition. This allows a multiple of the divisor and the remaining number to be divided separately. The results are then added to find the total quotient. Many children can partition and multiply with confidence. But this is not the case with division. One reason for this may be that mental methods of division, stressing the correspondence to mental methods of multiplication, have not in the past been given enough attention. Children should also be able to find a remainder mentally, for example the remainder when 34 is divided by 6.	One way to work out $TO \div O$ mentally is to partition TO into a multiple of the divisor plus the remaining units, then divide each part separately. Informal recording for $84 \div 7$ might be: 84 70 ↓ 10 + 14 ↓ 2 = 12 In this example, using knowledge of multiples, the 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) plus 14 and then each part is divided separately using the distributive law.
Phase 3: Chunking on a number line This method is based on subtracting multiples of the divisor from the number to be divided, the dividend. For $TO \div O$ there is a link to the mental method. As you record the division, ask: 'How many nines in 90?' or 'What is 90 divided by 9?'	To divide on a number line by chunking. $137/6 = 22 \text{ r } 5$ 10 + 10 + 2 r 5 0 60 120 132 137

Phase 4 Bus Stop It gets its name from the language used: “7 goes into 62 eight times remainder 6”. After children have mastered division by repeated subtraction, they use the “Bus Stop” method – familiar to many parents. $8672 \div 7 = 1238.857 \text{ r } 1$ 1 2 3 8 . 8 5 7 r 1 7) 8 16 2 7 62. 60 40 60	$97 \div 9$ $\begin{array}{r} 10 \text{ r } 7 \\ 9 \overline{) 97} \end{array}$ Answer: 10 R 7 $196 \div 6$ $98 \div 7$ becomes $\begin{array}{r} 14 \\ 7 \overline{) 98} \end{array}$ Answer: 14
Phase 5: Long Division The next step is to tackle $\text{HTO} \div \text{TO}$, which for most children will be in Year 6. The layout on the right, which links to chunking, is in essence the ‘long division’ method. Recording the build-up to the answer on the left of the calculation keeps the links with ‘chunking’ and reduces the errors that tend to occur with the positioning of the first digit of the answer. Conventionally the 20, or 2 tens, and the 3 units forming the answer are recorded above the line, as in the second recording.	How many packs of 24 can we make from 560 biscuits? Start by multiplying 24 by multiples of 10 to get an estimate. As $24 \times 20 = 480$ and $24 \times 30 = 720$, we know the answer lies between 20 and 30 packs. We start by subtracting 480 from 560. $\begin{array}{r} 24 \overline{) 560} \\ -480 \\ \hline 80 \\ -72 \\ \hline 8 \end{array}$ Answer 23 R 8 In effect, the recording above is the long division method, though conventionally the digits of the answer are recorded above the line shown below. $\begin{array}{r} 23 \\ 24 \overline{) 560} \\ -480 \\ \hline 80 \\ -72 \\ \hline 8 \end{array}$ Answer 23 r 8  
Short Division expressing the answer as a decimal or fraction	$25 \div 4 =$

Calculation Policy
September 2025

	$\begin{array}{r} \underline{6 \text{ r } 1} \\ 4 \overline{)25} \end{array}$ $\begin{array}{r} \underline{6 . 25} \\ 4 \overline{)25 . 00} \end{array}$ 6.25 or $6 \frac{1}{4}$
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Review Date: September 2028