Amblecote Primary School

Written Calculation Policy for Mathematics

As school we follow the guidance from
White Rose Maths

Key vocabulary for + - X ÷ written calculations

Addition	Subtraction	Multiplication	Division	Equals
Add	Between	Altogether	divide into	Balance
And	difference	Arrays	divide by	Equals to
Addition	decrease	By	divisible by	Equivalent
Altogether	fewer	groups of	division	Same as
Increase		inverse of ÷	half	Same value
inverse of –	inverse of +	lots of		
make	minus	multiply	inverse of x	
more	subtract	multiply by	remainder	
plus	subtraction	multiple of	quotient	
sum	take away	product	share equally	
total	less than			
		times		
		twice/double etc		

Early Years Foundation Stage (based on statutory framework for the Early Tears Foundation Stage 2021)			
Addition	**Subtraction**	**Multiplication**	**Division**
Count sets of objects reliably up to twenty.	Taking away ones	Double a number up to 10	Sharing objects up to 10 equally
Combining two parts to make a whole.	Counting back	Counting in 2s, 5s and 10s up to 20	
Start at a bigger number and count on.	Finding a missing part, given a whole and a part.		
Regrouping to make ten (number bonds)	Subtracting within 10		

ELG: Number: Children at the expected level of development will:

- Have a deep understanding of number to 10, including the composition of each number; 14

- Subitise (recognise quantities without counting) up to 5;

- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

ELG: Numerical Patterns: Children at the expected level of development will:

- Verbally count beyond 20, recognising the pattern of the counting system;

- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity;

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

Mathematics

Mathematics Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically. Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. By providing frequent and varied opportunities to build and apply this understanding - such as using manipulatives, including small pebbles and tens frames for organising counting - children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built. In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. It is important that children develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, 'have a go', talk to adults and peers about what they notice and not be afraid to make mistakes.

Multiplication X and Division ÷

Concrete	Pictorial	Abstract
➢ These are visual images of the actual resources to use within the classroom. ➢ Use a range of different practical resources. (e.g.base 10, place value counters, straws)	➢ These are pictorial representations that may appear in pupil's work. ➢ These can also be completed practically when needed.	These can be number lines, bar models, Part-part whole, formal methods

Grouping

EYFS	Learn to make equal groups from a whole and find how many equal groups of a certain size can be made. Sort a whole set people and objects into equal groups. There are 10 children altogether. There are 2 in each group. There are 5 groups.	Represent a whole and work out how many equal groups. There are 10 in total. There are 5 in each group. There are 2 groups.	

Sharing

EYFS	Share a set of objects into equal parts and work out how many are in each part. 		
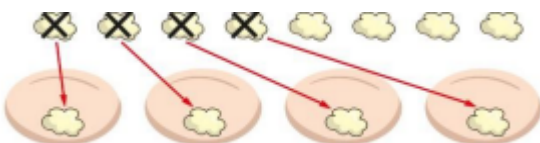
Progression in Maths	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Multiplication (calculation methods formal & informal)		calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs	write 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	multiply two-digit and three-digit numbers by a one-digit number using formal written layout	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	multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
Division (calculation methods formal & informal)					divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context	multiply one-digit numbers with up to two decimal places by whole numbers
						divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context
						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
Multiplying and dividing by 10, 100, 1000				find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths		multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
Multiplication and division facts		recall and use multiplication and division facts for 2, 5, 10 multiplication tables.	recall and use multiplication and division facts for 2, 3, 4, 5, 8, 10 multiplication tables.	recall and use multiplication and division facts for all multiplication tables up to 12 x 12.		
Problem Solving	solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher	solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts	solve problems, including missing number problems, involving multiplication and division	solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit	solve problems involving multiplication and division and a combination of these, including understanding the meaning of the equals sign	solve problems involving multiplication and division

Multiplication X

<table>
<tr>
<td>Concrete
➢ These are visual images of the actual resources to use within the classroom.
➢ Use a range of different practical resources. (e.g.base 10, place value counters, straws)</td>
<td>Pictorial
➢ These are pictorial representations that may appear in pupil's work.
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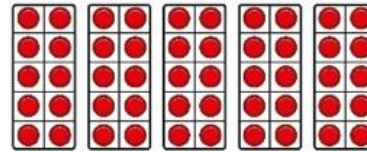<td>Abstract
These can be number lines, bar models, Part-part whole, formal methods</td>
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Find the total of equal groups by counting in 2s, 5s, 10s

Year 1

There are 5 pens in each pack …

5…10…15…20…25…30…35…40…

100 squares and ten frames support counting in 2s, 5s and 10s.
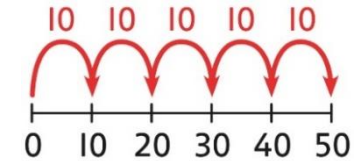
Equal groups/Repeated Addition
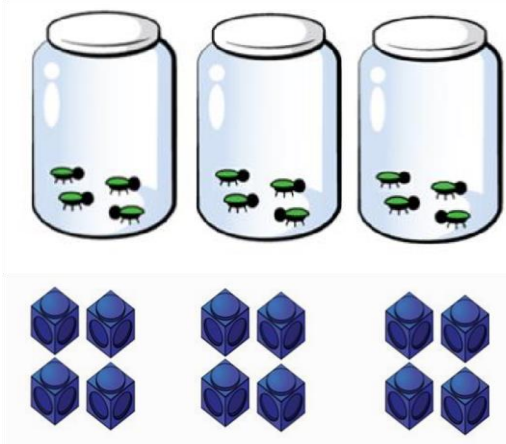
Year 2

4 x 3 = 12
3 x 4 = 12
4 + 4 + 4 = 12
There are 3 equal groups with 4 in each group.

4 x 3 = 12
3 x 4 = 12
4 + 4 + 4 = 12

4 x 3 = 15
3 x 4 = 15
4 + 4 + 4 = 12

Use arrays to understand commutativity
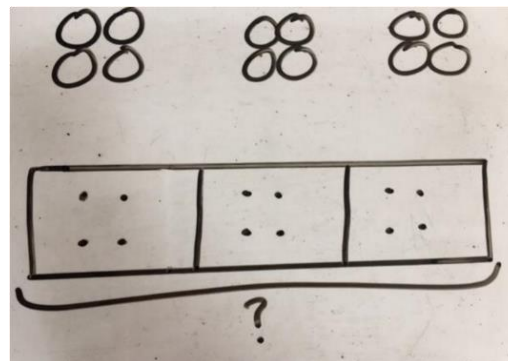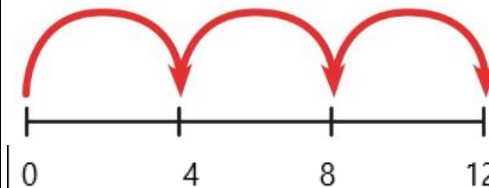
Year 2	I can see 6 groups of 3 I can see 3 groups of 6 2 lots of 5 5 lots of 2 2 × 5 = 5 × 2	Pupils to rotate the array, to show that orientation does not change the multiplication.	Pupils to be able to use an array to write a range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
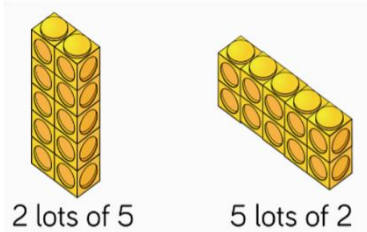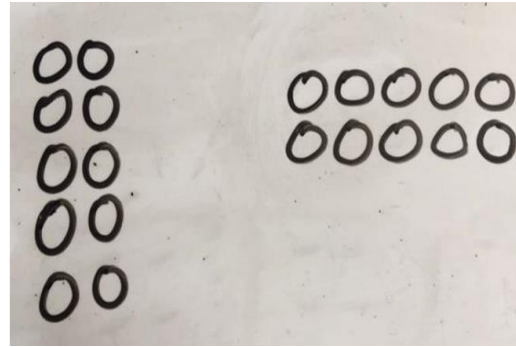
Short multiplication TO x O No exchange

Year 3	T | O 6 9 23 x 3 = 69	T | O OO | OOO OO | OOO OO | OOO 6 | 9	20 x 3 1 x 3 1 x 3 1 x 3 0 60 63 66 23 x 3 = 69 Leading to ... 23 × 3 69
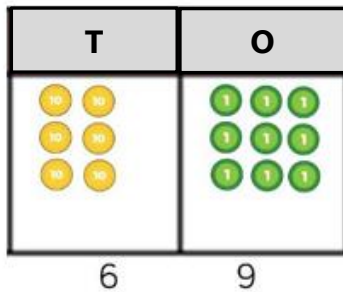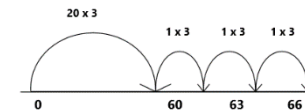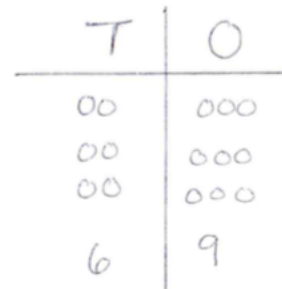
Short multiplication TO x O - Expanded Column Method

Year 3	**23 × 5 = ?** 3 × 5 = 15 20 × 5 = 100 23 × 5 = 115		**TO** 23 x 5 15 3 x 5 100 20 x 5 115 **TO** 23 x 5 115 1
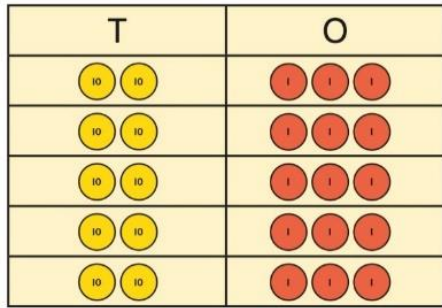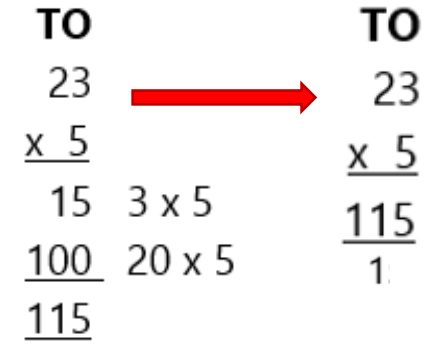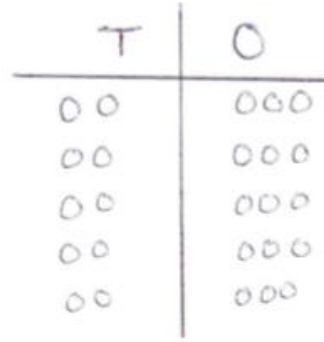
Short multiplication TO x O, HTO x O- Column Method
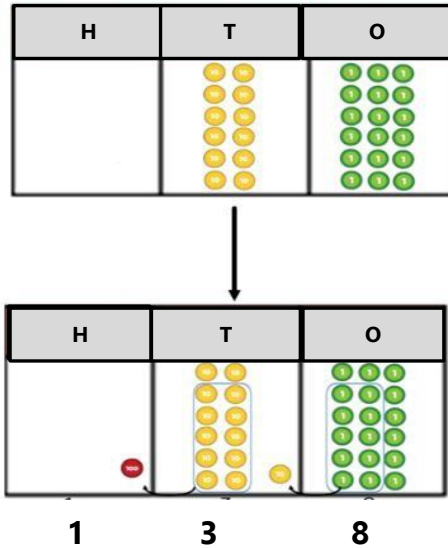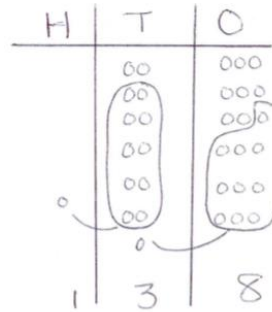
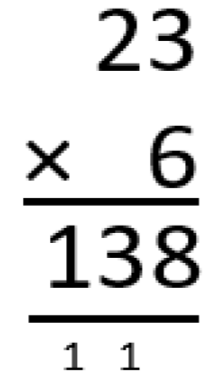|			
Years 3 & 4	**1 3 8** 23 x 6 = 138	23 x 6 = 138	23 x 6 138 1 1 Pupils to understand how the expanded column method is related to the formal column method.

Long multiplication - multi-digit numbers up to 4 digits x TO - Column Method

As pupils start to multiply multi-digit numbers up to 4 digits by a two-digit whole number, they should be confident with the abstract.

$$
\begin{array}{r}
3\ 4 \\
\times\ 2\ 7 \\
\hline
2\ 3\ _2 8 \quad 34 \times 7 \\
\hline
\hline
\end{array}
$$

$$
\begin{array}{r}
3\ 4 \\
\times\ 2\ 7 \\
\hline
2\ 3\ _2 8 \quad 34 \times 7 \\
6\ 8\ 0 \quad 34 \times 20 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
3\ 4 \\
\times\ 2\ 7 \\
\hline
2\ 3\ _2 8 \quad 34 \times 7 \\
6\ 8\ 0 \quad 34 \times 20 \\
9\ 1\ 8 \quad 34 \times 27 \\
\hline
\end{array}
$$

Ensure understanding of place value at each stage.

$$
\begin{array}{r}
1\ \ 2\ \ 4 \\
\times\ \ \ \ \ 2\ \ 6 \\
\hline
7\ \ 4\ \ 4 \\
_1\ \ \ _2 \\
2\ {}^-4\ \ 8\ \ 0 \\
\hline
3\ \ 2\ \ 2\ \ 4 \\
1\ \ \ 1 \\
\end{array}
$$

Answer: 3224

Multiplying decimals by whole number

| Year 6 | As pupils start to multiply one-digit numbers with up to two decimal places by whole numbers, they should be confident with the abstract. | $$\begin{array}{r} 4.72 \\ \times\ 3 \\ \hline 14.16 \\ 2 \end{array}$$ |

Division ÷

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Grouping

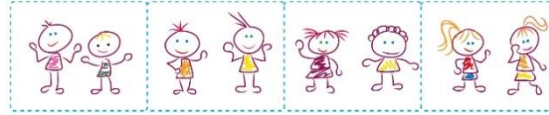|			
Year 1	 Sort a whole set people and objects into equal groups. There are 10 children altogether. There are 2 in each group. There are 5 groups	 Represent a whole and work out how many equal groups. There are 10 in total. There are 5 in each group. There are 2 groups.	 Children may relate this to counting back in steps of 2, 5 or 10.

Sharing
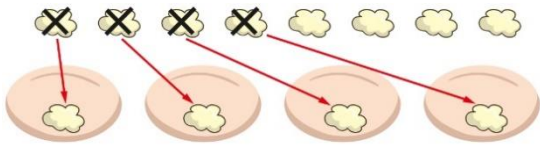
Year 1	Share a set of objects into equal parts and work out how many are in each part**.**	Sketch or draw to represent sharing into equal parts.	10 shared into 2 equal groups gives 5 in each group.

Grouping equally / Making equal groups

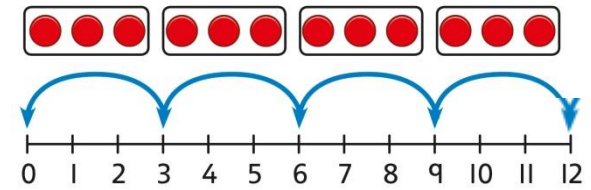|			
Year 2	There are 8 children. There are two children in each group. There are 4 groups. 8 divided into 4 equal groups = 2 in each group	$12 \div 3 = 4$ $12 \div 4 = 3$ $12 \div 6 = 2$ $12 \div 2 = 6$	There are 4 groups now. Count up from 0 in 3's. 12 divided into groups of 3. $12 \div 3 = 4$ There are 4 groups.

Sharing equally
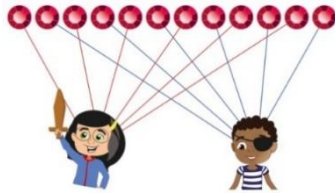
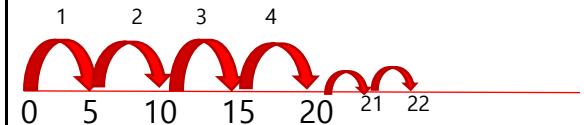| Year 2		
12 shared equally between 2. They get 6 each.	20 shared into 5 equal parts. There are 4 in each part.	18 ÷ 2 = 9
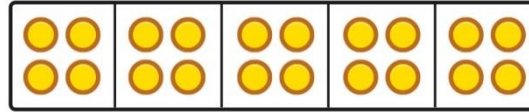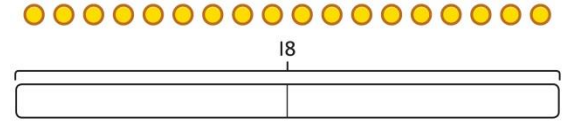
Understand remainders

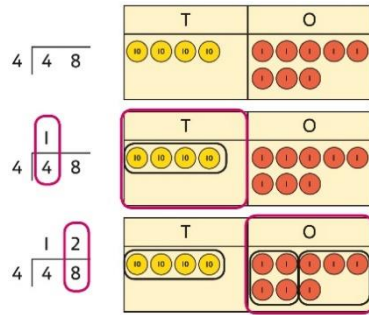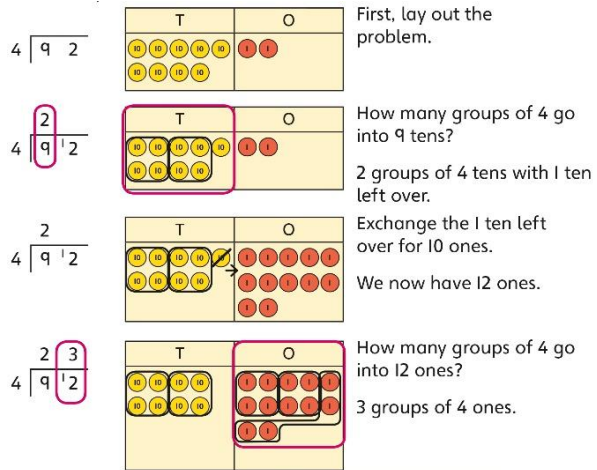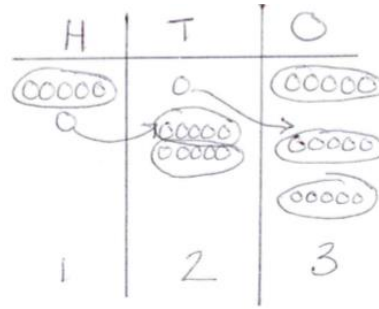| Year 3		
There are 13 sticks in total. There are 3 groups of 4, with 1 remainder.	22 ÷ 5 = 4 remainder 2	22 ÷ 5 = ? $3 \times 5 = 15$ $4 \times 5 = 20$ $5 \times 5 = 25$ … this is larger than 22 So, 22 ÷ 5 = 4 remainder 2
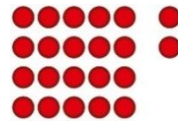
Short Division – TO ÷ O, HTO ÷ 0, ThHTO ÷ O

Years 3, 4, 5

With exchange
(if required)

First, lay out the problem.

How many groups of 4 go into 9 tens?

2 groups of 4 tens with 1 ten left over.

Exchange the 1 ten left over for 10 ones.

We now have 12 ones.

How many groups of 4 go into 12 ones?
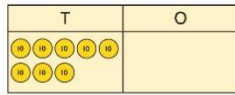
3 groups of 4 ones.

With exchange and remainders

615 ÷ 5 = 123

[Follow this link to support short division with and without remainders using place value counters](#)

$$5 \overline{\smash{)}6^{1}1^{1}5} = 123$$

$$7 \overline{\smash{)}3\,{}^{3}8\,{}^{3}9\,{}^{4}2} = 0556$$

$6 \overline{)8\ 0}$	**T** / **O**	Lay out the problem as short division.
$6 \overline{)8\ ^20}$ with 1	**T** / **O**	How many groups of 6 go into 8 tens? There is 1 group of 6 tens. There are 2 tens remaining.
$6 \overline{)8\ ^20}$ with 1 3 r2	**T** / **O**	How many groups of 6 go into 20 ones? There are 3 groups of 6 ones. There are 2 ones remaining.
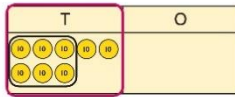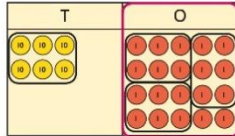
$$432 \div 5 = 86\ r2$$

$$5 \overline{)4\ 3\ ^32}\quad =\quad 8\ 6\ r2$$

or

$$432 \div 5 = 86\ \tfrac{2}{5}$$

Pupils to represent remainder as 'r' or a fraction

As pupils start to divide numbers up to 4-digits by a two-digit whole number they should be confident with the abstract.

The method of 'chunking' which uses knowledge of multiplication facts and repeated subtraction may be adopted as a informal written methid of division.

Progress the long division with decimals.

2 8 . 8

1 5 | 4 3 2 . 0
3 0
1 3 2
1 2 0
1 2 0
1 2 0
0

432 ÷ 15 = 28.8

Short ÷
(use multiples of the divisor to support)
E.g.

4320 ÷ 15 = 288

2 8 8

15 | 4 ⁴3 ¹³2 ¹²0

| 15 |
| 30 |
| 45 |
| 60 |
| 75 |
| 90 |
| 105 |
| 120 |
| 135 |

Chunking

22 r 8

13 | 294
130   (10x13)
164
130   (10x13)
34
26   (2x13)
8

20 x 13 = 260
10 x 13 = 130
5 x 13 = 65
2 x 13 = 26
1 x 13 = 13

Formal Written Long Division

4 4 6 5 ÷ 1 9 = 2 3 5

0 2 3 5

1 9 | ⁴4 ⁴6 5
- 3 8 ↓
0 ⁵6 ⁶6
- 5 7 ↓
0 9 5

① 1 9
② 3 8
③ 5 7
④ 7 6
⑤ 9 5