

Kearsley West Written Calculation Policy

- This policy was written in consultation with staff to ensure progression and continuity of pencil and paper procedures throughout the school.
- It is important to note that written calculations are not a replacement for mental calculation. As there is some element of mental calculations in all these pencil and paper methods children need to continue to have rapid recall of number bonds and x tables.
- The following document will outline the pencil and paper procedures taught in school. It will demonstrate which stages the children need to take in order to develop an efficient method for calculating.
- The written methods will start when the children are ready. Children begin by using pictures and jottings to support their learning and when ready move on to more formal recording.
- The stages are progressive and children will only move on as and when they are ready and may move back to a familiar method if needed.
- The written calculations policy supports the New Curriculum and outlines the expectations in each year group.
- The written calculation policy will be supported by a CPA (concrete, pictorial, abstract) approach to learning. It is a highly effective approach to learning that develops a deep sustainable understanding of maths.

1. Written calculation methods for the 4 rules of number need to be built on mental strategies.

Children should always be encouraged to ask-

- Can I do it in my head?
- Do I need jottings to help me use mental methods?
- Would a written method be the most efficient for this calculation?

2. Estimate. “Is my answer sensible?” Children should be encouraged to estimate from the earliest stages.

Multiplication and Division

Always build on mental strategies. Assess children’s knowledge and understanding.

Can the children

- Count in steps of 2, 5, 10, 3 etc – forwards and backwards?
- Group numbers into equal groups?

Do the children

- Use known facts to help with calculations or work out facts needed from known facts?
- Multiply and divide by 10 and 100 confidently?

Always, from the earliest stages, emphasise inverse operations

$$6 \times 2 = 12 \quad 2 \times 6 = 12$$

$$12 \div 6 = 2 \quad 12 \div 2 = 6$$

MULTIPLICATION X

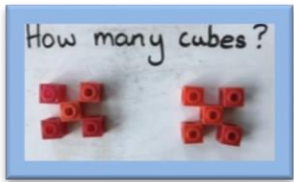
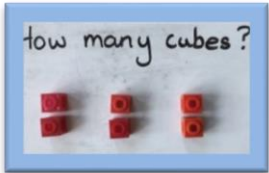
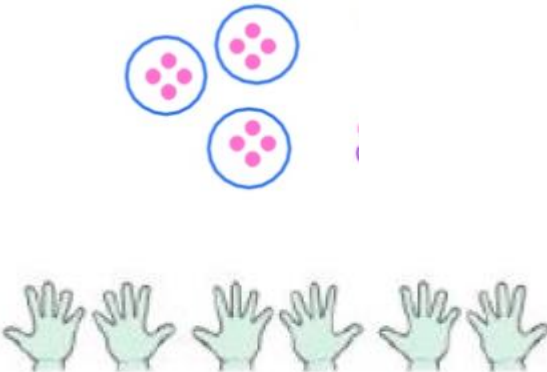
Year 1

Statutory requirements

Pupils should be taught to:

- solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Key vocabulary groups of, lots of, times, array, altogether, multiply, count

Concrete	Pictorial	Abstract
<p>Use concrete objects to support one step problems.</p>  <p>Grouping concrete objects starting with doubles.</p>  <p>Grouping objects in equal groups using vocabulary of groups of.</p>	<p>Groups of objects</p> 	

MULTIPLICATION X

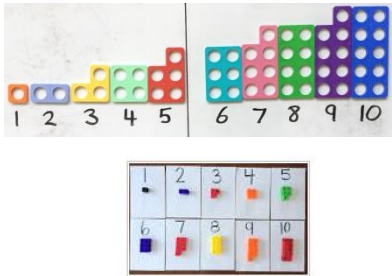
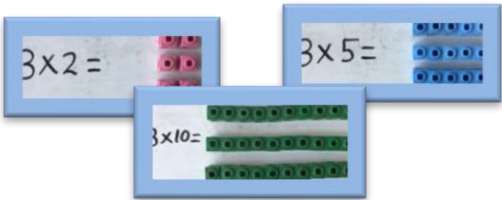
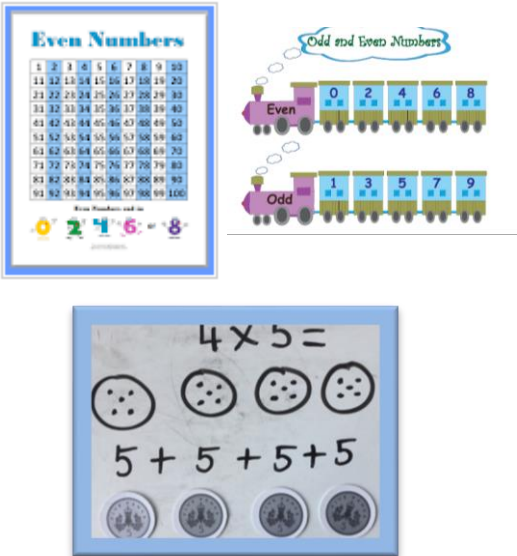
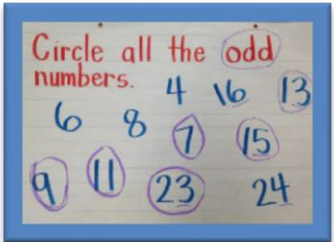
Year 2

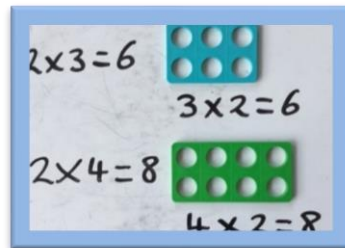
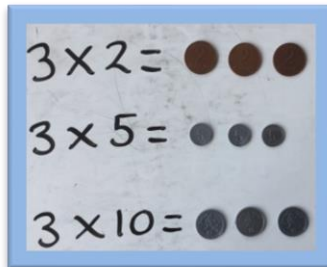
Statutory requirements

Pupils should be taught to:

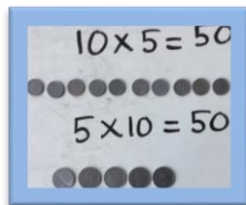
- recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication ($\times$) and equals ($=$) signs
- show that multiplication of two numbers can be done in any order (commutative)

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times...

Concrete	Pictorial	Abstract
<p>Recognising odd and even numbers.</p>  <p>Grouping objects in equal groups using vocabulary of groups of.</p> 		 <p>$4 \times 5 = 20$</p>



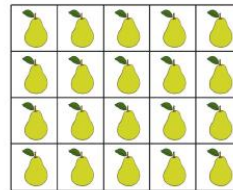
Show that multiplication of two numbers can be done in any order.



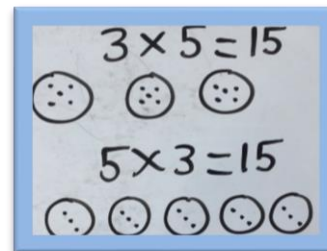
How many strawberries are there?



How many pears are there?



4 x 2 = 8p or 2 x 4 = 8p



$$2 \times 4 = 8$$

$$3 \times 5 = 15$$

MULTIPLICATION X

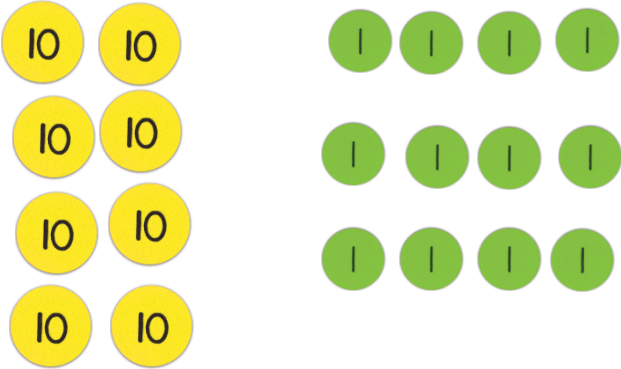
YEAR 3

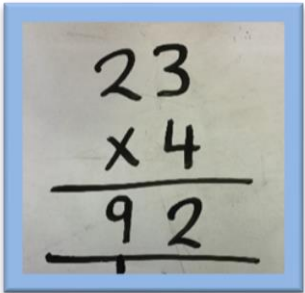
Statutory requirements

Pupils should be taught to:

- recall and use multiplication facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, **times**, **partition**, **multiple**, **product**, **tens**, **units**.

Concrete	Pictorial	Abstract
	<p>By partitioning the numbers and then recombining. $23 \times 4 =$</p> <p>$20 \times 4 = 80$ $3 \times 4 = 12$</p> 	<p>TU x U By partitioning the numbers and recombining.</p> <p>$23 \times 4 = 92$</p> <p>$20 \times 4 = 80$ $3 \times 4 = 12$ $= 92$</p>

		<p>Leading to a compact method including carrying.</p> 
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MULTIPLICATION X

Year 4

Statutory requirements

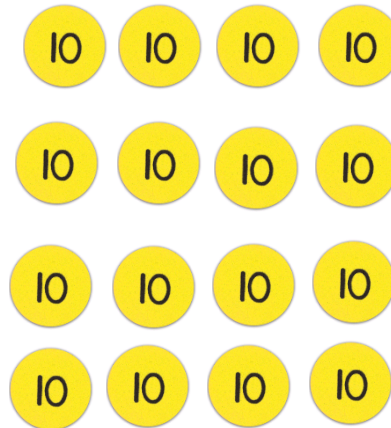
Pupils should be taught to:

- multiply two-digit and three-digit numbers by a one-digit number using formal written layout

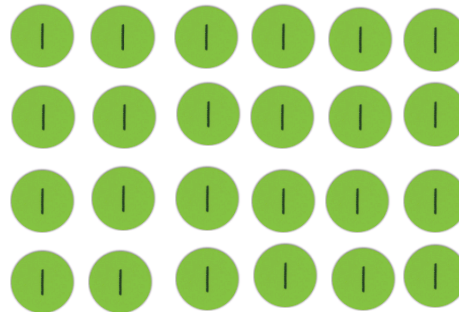
Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times, partition, multiple, product, tens, units, **inverse**

Concrete	Pictorial	Abstract
	<p>By partitioning the numbers and then recombining.</p> <p>346 x 4 = 1384</p> <p>300 x 4 = 1200</p> <div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div></div>	<p>HTU x U</p> <p>By partitioning the numbers and recombining.</p> <p>346 x 4 = 1384</p> <div><div>6 x 4</div><div>40 x 4</div><div>300 x 4</div><div><div>346</div><div>X 4</div><div><div>24</div><div>160</div><div>1200</div><div>1384</div></div></div></div> <p>Leading to a compact method including carrying.</p>

$$40 \times 4 = 160$$



$$6 \times 4 = 24$$



Handwritten multiplication problem:

$$\begin{array}{r} 346 \\ \times 4 \\ \hline 1384 \end{array}$$

MULTIPLICATION X

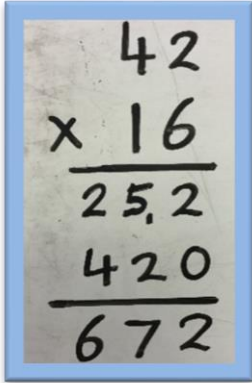
Year 5

Statutory requirements

Pupils should be taught to:

- 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 whole numbers and those involving decimals by 10, 100 and 1000

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times, partition, multiple, product, tens, units, **inverse**, **square**, **factor**, **integer**, **decimal**, **short/long multiplication**,

Concrete	Pictorial	Abstract
		<p>TU x TU By holding the place value.</p>  $\begin{array}{r} 42 \\ \times 16 \\ \hline 252 \\ 420 \\ \hline 672 \end{array}$

HTU x TU

By holding the place value

$$\begin{array}{r} 372 \\ \times 24 \\ \hline 1488 \\ 7440 \\ \hline 8928 \end{array}$$

Multiply by 10 100 and 100

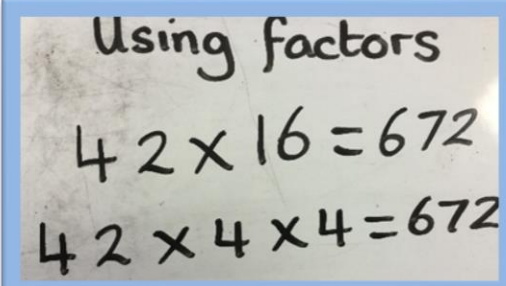
Hundreds	Tens	Units/Ones	Tenths	Hundredths	Thousandths	Ten of Thousandths
	6	1	0			
	6	1				
	0	6	1			
	0	0	6	1		

Have you spotted a pattern?

Diagram illustrating multiplication by 10, 100, and 1000 using place value shifts. Arrows show the movement of digits from one place value to the next, corresponding to the multipliers $\times 10$, $\times 100$, and $\times 1000$.

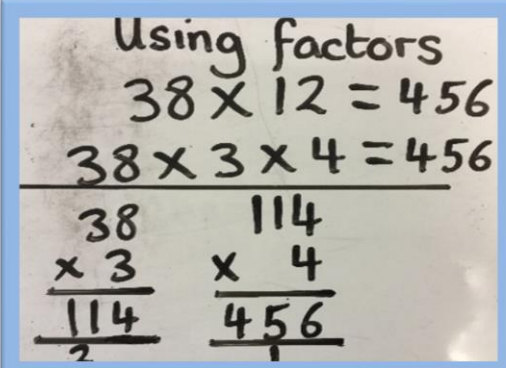
The same methods will be used for decimals

Towards the end of the year the children will



Using factors
 $42 \times 16 = 672$
 $42 \times 4 \times 4 = 672$

be encouraged to start factorising.



Using factors
 $38 \times 12 = 456$
 $38 \times 3 \times 4 = 456$

$\begin{array}{r} 38 \\ \times 3 \\ \hline 114 \\ \hline \end{array}$	$\begin{array}{r} 114 \\ \times 4 \\ \hline 456 \\ \hline \end{array}$
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MULTIPLICATION X

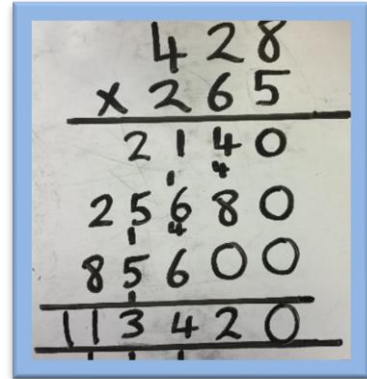
YEAR 6

Statutory requirements

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times, partition, multiple, product, tens, units, inverse, square, factor, integer, decimal, short/long multiplication, **tenths**, **hundredths**

Concrete	Pictorial	Abstract
		<p>HTU x HTU (long multiplication) By</p>  <p>holding the place value</p>

