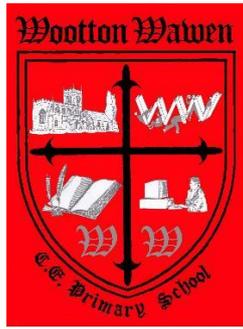


Wootton Wawen C.E. Primary School



A Guide to Written Calculations in Maths

Many parents were taught completely different methods of written calculation to the ones we are using now therefore we have produced this booklet to aid you in helping your child with their mathematics. The booklet provides a summary of the stages in written calculations for the four operations of addition, subtraction, multiplication and division. For greater detail please refer to our Calculation Policy which can be found on the school web site.

The ability to calculate mentally forms the basis of all written calculations and initially the focus is on teaching these mental facts (see Parents' Guide to Mental Maths). Children will be using a range of practical activities to develop a secure understanding of place value and number facts. During this stage much written recording is done informally.

As the children become confident with numbers and their mental recall of number bonds and multiplication facts are secured, they begin to look at more formal written methods. By the end of Year 3 children will have been taught how to record their calculations using a column method. As they move through Key Stage 2 they will work towards an efficient and compact written method. The aim is that, by the end of Key Stage 2, they are able to confidently and accurately use an efficient written method to solve calculations with large numbers, decimals and fractions.

Our priority when teaching children written methods is to ensure they have a secure understanding of the method and can use it in a range of contexts. We do not rush them through the stages as quickly as possible. Pupils who grasp methods quickly are challenged by being offered a wide range of problem solving activities, many of which are real-life based.

Children do not necessarily go through all the stages of written recording as set out on pages 4-8. For example, some children who have a secure knowledge of place value may move from Stage 5 to Stage 7 in addition without doing the column addition with partitioning stage.

Please see your child's class teacher if you require any further information.

National Curriculum 2014 Expectations

The table below sets out the end of year expectations for written calculations in the four operations based on the National Curriculum 2014

	Addition and Subtraction	Multiplication and Division
EYFS	Says which number is one more or one less than a given number to 20.	
By the end of Year 1 children should:	<p>Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=)</p> <p>Represent and use number bonds and related subtraction facts within 20 e.g. $5 + 2 = 7$, $7 - 2 = 5$, $7 - 5 = 2$</p> <p>Add and subtract one-digit and two-digit numbers to 20, including 0</p> <p>Solve one-step problems that involve addition and subtraction using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$</p>	Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with support of the support of an adult
By the end of Year 2 children should:	<p>Use concrete objects and pictorial representations to solve problems, on paper, with addition and subtraction including money and measures</p> <p>Add and subtract numbers using concrete objects, pictorial representations, and mentally including adding or subtracting one or ten to/from a two-digit number, adding and subtracting two two-digit numbers and adding three one-digit numbers</p> <p>Know and show that addition of numbers can be done in any order and that subtraction of one number from another cannot</p> <p>Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve number problems</p>	<p>Recall and use multiplication AND division facts for the 2, 5 and 10 multiplication tables</p> <p>Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x) and division (÷) and equals (=) signs</p> <p>Show that multiplication of two numbers can be done in any order and division of one number by another cannot</p> <p>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context e.g. money and measures</p>
By the end of Year 3 children should:	<p>Add and subtract numbers with up to three-digits using an efficient written method</p> <p>Estimate the answers to a calculation and use the inverse to check answers</p> <p>Solve missing number problems using number facts, place value, and more complex addition and subtraction.</p>	<p>Multiply and divide numbers mentally and using an efficient written method (up to $TU \times U$ and $TU \div U$)</p> <p>Solve problems, including missing number problems, involving multiplication and division, including scaling problems</p>
By the end of Year 4 children should:	<p>Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate</p> <p>Estimate and use inverse operations to check answers to a calculation</p> <p>Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why</p>	<p>Multiply two-digit and three-digit numbers by a one-digit number using formal written layout</p> <p>Divide two-digit numbers by a single digit (leading to short division)</p> <p>Solve problems involving multiplying and division, including scaling problems</p> <p>Solve problems involving division including questions such as 3 cakes shared equally between 10 children.</p>

<p>By the end of Year 5 children should:</p>	<p>Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)</p> <p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</p>	<p>Multiply numbers up to 4 digits by a 1- or 2-digit number using a formal written method, including long multiplication for 2-digit numbers</p> <p>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</p> <p>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000</p> <p>Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes</p> <p>Solve problems involving all four operations and a combination of these, including understanding the meaning of the equals sign</p> <p>Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates</p>
<p>By the end of Year 6 children should:</p>	<p>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication</p> <p>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</p> <p>Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context</p> <p>Use knowledge of the order of operations to carry out calculations involving the 4 operations</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</p> <p>Solve problems involving addition, subtraction, multiplication and division</p> <p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy</p>	

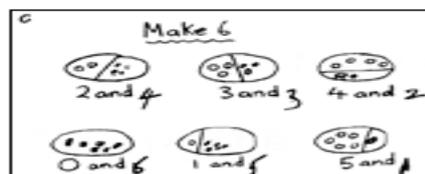
Stages in Written calculation for Addition

Stage 1

Combining groups of objects to find a total

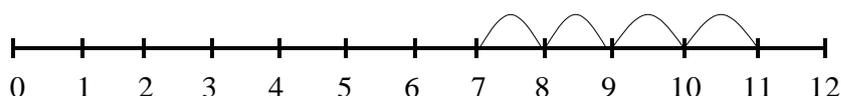
Understanding what the + and = sign mean and record simple number sentences

eg. $3+4=7$



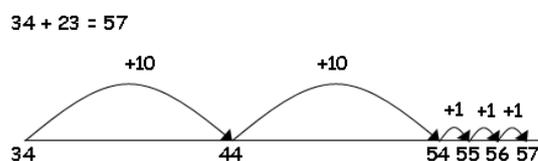
Stage 2

Using a number line to count on in ones



Stage 3

Using the number line to jump in tens and single digit numbers from any 2-digit number



Stage 4

Partition into tens and ones and recombine

$$12 + 23 = 10 + 2 + 20 + 3 = 30 + 5 = 35$$

Stage 5

Column addition for adding pairs of numbers using partitioning

H	T	U	
300	80	7	
100	30	4	+
400	110	11	= 521

Stage 6

Column addition using partitioning

$$\begin{array}{r}
 67 \\
 + 24 \\
 \hline
 11 \text{ (7 + 4)} \\
 80 \text{ (60 + 20)} \\
 \hline
 91
 \end{array}$$

$$\begin{array}{r}
 267 \\
 + 85 \\
 \hline
 12 \text{ (7 + 5)} \\
 140 \text{ (60 + 80)} \\
 \hline
 200 \\
 \hline
 352
 \end{array}$$

Stage 7

Compact column addition moving to large numbers and decimals.

$$\begin{array}{r}
 625 \\
 + 48 \\
 \hline
 673 \\
 1
 \end{array}$$

$$\begin{array}{r}
 783 \\
 + 42 \\
 \hline
 825 \\
 1
 \end{array}$$

$$\begin{array}{r}
 367 \\
 + 85 \\
 \hline
 452 \\
 11
 \end{array}$$

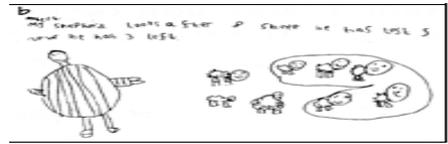
Stages in Written calculation for Subtraction

Stage 1

Take away a number of objects from the group and count what is left.

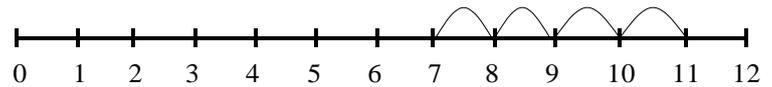
Understanding what the + and = sign mean and record simple number sentences

eg. $7-4=3$



Stage 2

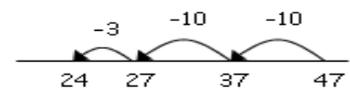
Using a number line to count back in ones



Stage 3

Using the number line to jump back in tens and single digit numbers from any 2-digit number

$$47 - 23 = 24$$



Stage 4

Column subtraction for taking away pairs of numbers using partitioning with no decomposition and then with decomposition

$$\begin{array}{r} 89 \\ - 57 \\ \hline \end{array} = \begin{array}{r} 80 + 9 \\ 50 + 7 \\ \hline 30 + 2 = 32 \end{array}$$

Stage 5

Column subtraction for taking away pairs of numbers using partitioning without decomposition and then with decomposition

$$\begin{array}{r} 71 \\ - 46 \\ \hline \end{array} = \quad =$$

Step 1
$$\begin{array}{r} 70 + 1 \\ - 40 + 6 \\ \hline \end{array}$$

Step 2
$$\begin{array}{r} 60 + 11 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

The calculation should be read as e.g. take 6 from 1.

This would be recorded by the children as

$$\begin{array}{r} \cancel{70} + 1 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

Stage 6

Compact column subtraction moving to large numbers and decimals.

$$\begin{array}{r} 6141 \\ \cancel{7}4 \\ - 286 \\ \hline 468 \end{array}$$

Stages in Written calculation for Multiplication

Stage 1

Understand that multiplication is repeated addition and use pictures to count groups

Counting in different steps

Stage 2

Understand the X = signs and missing numbers

Be able to solve simple sums using apparatus

$6 \times 2 = \square$

$\square = 6 \times 2$

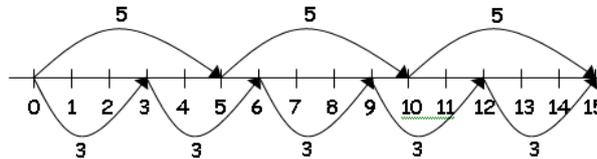
$6 \times \square = 12$

$12 = 6 \times \square$

Stage 3

Using a number line to count on in ones

Children should know that 3×5 has the same answer as 5×3 . This can also be shown on the number line.



Stage 3

Using arrays



$5 \times 3 = 15$

$3 \times 5 = 15$

Stage 4

Double two digit numbers using partitioning

$8 \times 2 = 16$ (double the units)

double 15

$$\begin{array}{r} 10 + 5 \\ \downarrow \quad \downarrow \end{array}$$

$20 + 10 = 30$

Stage 5

Using grid method and /or formal written method to multiply TU by U and then HTU by U

34x6

	30	4
x 6	180	24

$180+24=204$

$$\begin{array}{r} 38 \\ \times 7 \\ \hline 56 \quad (8 \times 7 = 56) \\ \underline{210} \quad (30 \times 7 = 210) \\ 266 \end{array}$$

$$\begin{array}{r} 38 \\ \times 7 \\ \hline \underline{266} \\ 5 \end{array}$$

Stage 6

Using formal written method to multiply TU by TU and then HTU by TU,

286

$\times 29$

$2574 \quad (9 \times 286 = 2574)$

$5720 \quad (20 \times 286 = 5720)$

8294

1

Extend to any numbers of digits and decimals

Stages in Written calculation for Division

Stage 1

Understand sharing and grouping



Share 6 sweets between 2 people



How many groups of two are there?

Stage 2

Understand the \div = signs and missing numbers

Be able to solve simple sums using apparatus

$$6 \div 2 = \square$$

$$\square = 6 \div 2$$

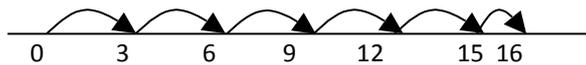
$$6 \div \square = 3$$

$$3 = 6 \div \square$$

Stage 3

Grouping on a number line both without and then with a remainder

$$16 \div 3 = 5 \text{ r}1$$



Stage 4

Using chunking to divide TU by U setting out vertically

$$72 \div 3$$

$$\begin{array}{r} 3 \overline{) 72} \\ - 30 \\ \hline 42 \\ - 30 \\ \hline 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline 0 \end{array} \quad \begin{array}{l} 10x \\ 10x \\ 2x \\ 2x \\ \hline 24 \end{array}$$

Stage 5

Using short method to divide TU or HTU by a single digit with or without remainders. Extend to any numbers of digits and decimals.

$$5 \overline{) 847} \begin{array}{l} 169 \\ \text{r}2 \end{array}$$

remainders can be recorded as whole numbers or fractions

Stage 6

Using chunking to divide HTU by TU

$$\begin{array}{r} 27 \\ 36 \overline{) 972} \\ - 720 \\ \hline 252 \\ - 252 \\ \hline 0 \end{array} \quad \begin{array}{l} 20x \\ 7x \\ \hline \end{array}$$

Extend to any numbers of digits and decimals.