



Calculation Policy (Updated February 2017)

Rationale

The 2011 OFSTED published report in *Good Practice in Primary Mathematics* states that “A feature of strong practice in the maintained schools is their clear, coherent calculations policies and guidance, which are tailored to the particular school’s context. They ensure consistent approaches and visual images and models that secure progression in pupils’ skills and knowledge lesson by lesson and year by year.”

Aims

At Grasmere Academy, we aim for all children to become fluent at using written methods in all four operations by the end of Key Stage 2. They will use all written methods with confidence and understanding in a range of contexts. The progression in calculation skills and expectations meets the needs of the National Curriculum for 2014.

Although each operation is broken down into stages and identifies year group expectations, we recognise that children do not progress at the same rate . Therefore, children will be taught to their individual mathematical needs, working at the appropriate stage for their development.

We recognise the importance in using visual models, images and equipment throughout primary school to support children’s understanding of new mathematical concepts and methods. Wherever possible, we will continue to use these aids to secure understanding and fluency of written methods. These are identified as ***bold italics*** in the policy.

We will ensure the development of mental maths skills continues to be a main focus and written methods will be taught to children as a tool to enable them to solve increasing complex problems with accuracy and efficiency. We recommend children make approximations before using a written method when solving calculations and they frequently use inverse operations to check their answers.

This policy is a working document and will be updated on a regular basis. It will be written and changed in line with government requirements, but most importantly, to meet the needs of the children and staff at Grasmere Academy.

From Year 1 children will be taught the Part Part Whole Model to aid calculation and problem solving.

From Year 2 onwards children will use the Singapore Bar Method to aid problem solving by showing the calculation in a pictorial form. (See Bar Model Stages)

Consultation Date:
Date agreed by Governors:
Date policy became effective:
Review Date:

++ Addition ++

Stage 1

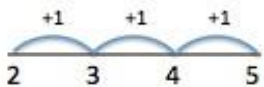
Children understand the concept of addition as the combining of 2 or more groups. Children use the + and = symbols accurately. Calculations should be written on either side of the equals sign so that = is not just interpreted as the answer.

$$6 + 2 = 8 \quad 8 = 6 + 2$$

Children use **Numicon** and other visual representations to add 2 or more amounts.



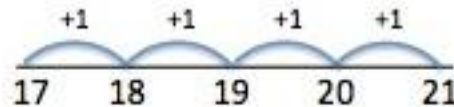
Extend to counting up in ones on a number line. Using **Numicon** to add.



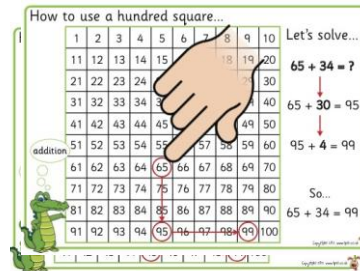
Stage 2

Adding 2-digit numbers with single units, bridging through multiples of 10, using a **number line**.

$$17 + 4 = 21$$



Use **100 square** to begin to add two-digit numbers by counting in tens and ones.



Stage 3

The **number line** is extended to partitioning and adding tens then ones when faced with larger numbers.

$$17 + 14 = 31$$



Leading to simple column addition of 2-digit numbers with no carrying using **Place Value Counters**.

Pupils must have a good understanding of place value and partitioning.

$\begin{array}{r} 30 + 6 \\ + 10 + 2 \\ \hline 40 + 8 = 48 \end{array}$	$\begin{array}{r} 36 \\ + 12 \\ \hline 48 \end{array}$
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RECOMMENDED BY THE END OF YEAR 2

Stage 4

Column addition of 2, 3 and 4-digit numbers using expanded methods.

$\begin{array}{r} 600 + 40 + 3 \\ + 200 + 20 + 5 \\ \hline 800 + 60 + 8 = 868 \end{array}$	$\begin{array}{r} 643 \\ + 225 \\ \hline 868 \end{array}$	$\begin{array}{l} 600 + 40 + 3 \\ + 200 + 20 + 5 \\ \hline 800 + 110 + 8 = 918 \end{array}$
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RECOMMENDED BY THE END OF YEAR 3

Stage 5

Short written methods using 'carrying'. The carrying digit goes underneath the answer.

Using 4-digit numbers leading to decimals

$\begin{array}{r} 7893 \\ + 5385 \\ \hline 13278 \\ 11 \end{array}$	$\begin{array}{r} 31.76 \\ + 18.07 \\ \hline 49.83 \\ 1 \end{array}$
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RECOMMENDED BY THE END OF YEAR 4

Notes

In Years 5 and 6, pupils continue practicing formal written methods with increasing large numbers so they become fluent and precise.

... Subtraction ...

Stage 1

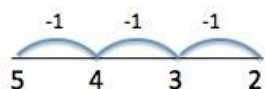
Children understand the concept of subtraction as the taking a number away from another. Children use the $-$ and $=$ symbols accurately. Calculations should be written on either side of the equals sign so that $=$ is not just interpreted as the answer.

$$6 - 2 = 4 \quad 4 = 6 - 2$$

Children use **Numicon** and other visual representations to subtract numbers.



Extend – counting backwards in ones on a number line.



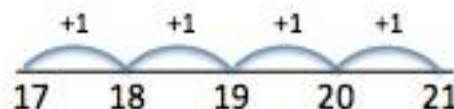
Using **Numicon** to subtract.



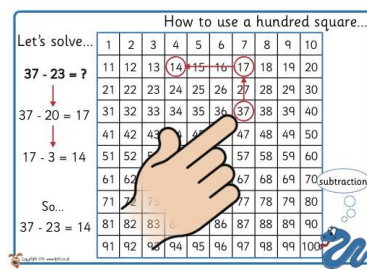
Stage 2

Begin to 'find the difference' by counting on in ones using a **number line**.

$$21 - 17 = 4$$



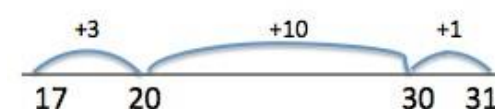
Use **100 square** to subtract two two-digit numbers by counting back in tens and ones.



Stage 3

The **number line** is extended to partitioning and adding tens then ones when faced with larger numbers.

$$31 - 17 = 14$$



Using empty number lines to find the difference by partitioning numbers and counting on in tens and ones.

Leading to simple column subtraction of 2-digit numbers using **Place Value Counters**.

Pupils must have a good understanding of place value and partitioning.

Partitioning numbers first	le. 36 to
$30 + 6$	$- 12$
$- 10 + 2$	24
$20 + 4 = 24$	24

RECOMMENDED BY THE END OF YEAR 2

Stage 4

Column subtraction of 3 and 4-digit numbers using expanded methods using **Place Value Counters**.

Partitioning numbers first	leading	then introducing
$600 + 40 + 3$	643	$600 + 90 + 3$
$+ 200 + 20 + 1$	$- 221$	$+ 200 + 70 + 5$
$400 + 20 + 2 = 422$	422	$400 + 10 + 8 = 418$

RECOMMENDED BY THE END OF YEAR 3

Stage 5

Short written methods using 'borrowing'.

Using 4-digit numbers leading to decimals

$8 \overline{) 7893}$	$5 \overline{) 36.76}$
$- 5385$	$- 13.87$
2508	22.89

RECOMMENDED BY THE END OF YEAR 4

Notes

In Years 5 and 6, pupils continue practicing formal written methods with increasing large numbers so they become fluent and precise.

x x Multiplication x x

Stage 1

Children begin to understand the concept of multiplication and recognise the 'x' symbol.

Children use **Numicon** and other visual representations to show groupings of amounts.



3 lots of 2 $3 \times 2 = 6$

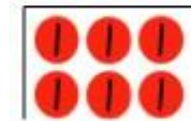


4 groups of 3 $4 \times 3 = 12$

Stage 2

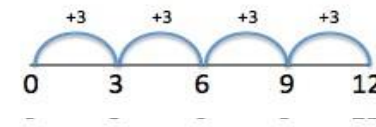
To describe multiplication as an array and begin to recognise multiplication can be done in any order. Use the 'x' symbol with confidence.

Using an array using **Place Value Counters**.



To use a **number line** to show multiplication as **repeated addition**.

$$4 \times 3 = 12 \quad \text{or} \quad 3 + 3 + 3 + 3 = 12$$



RECOMMENDED BY THE END OF YEAR 2

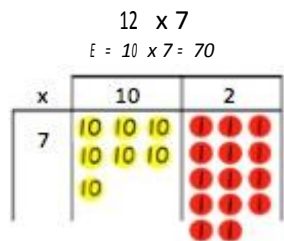
Stage 3

To use 'grid method' as an informal method to carry out multiplication calculations using **Place Value Counters** as a visual representation. Use numbers appropriate to current level of attainment. Encourage children to estimate their answers first.

Using visual representation

leading to

leading to



23×8
 $E = 20 \times 10 = 200$

x	20	3
8	160	24

=184

372×24
 $E = 400 \times 20 = 8000$

x	300	70	2
20	6000	1400	40
4	1200	280	8

7440
1488

8928

1

RECOMMENDED BY THE END OF YEAR 4

Stage 4

To use formal written methods to multiply 4 digits by 1 or 2-digit numbers (Year 5) and one digit numbers with to two decimal places by whole numbers (Year 6).

Short Multiplication

leading to

Long Multiplication

23×7
 $E = 20 \times 10 = 200$

x	23
7	161

leading to

23×7
 161

2

124×26
 $E = 12 \times 100 = 1200$

x	124
26	744
+	2480
	3224

11

11

CHILDREN SHOULD BE PRACTISING AND SECURING THESE FORMAL WRITTEN METHODS IN YEARS 5 AND 6

÷ ÷ Division ÷ ÷

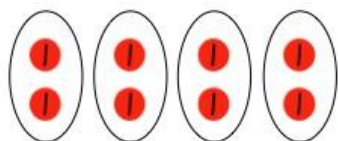
Stage 1

Children begin to understand the concept of division as 'grouping' and recognise the '÷' symbol. Use a range of model and images to show 'sharing' an amount equally.



6 shared equally by 3 is 2 $6 \div 3 = 2$

Sharing using **Place Value Counters**.

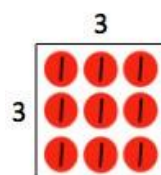
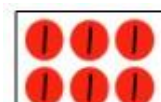


8 shared equally by 4 is 2 $8 \div 4 = 2$

Stage 2

To describe division as sharing an amount equally. To understand division within the multiplication tables $U \div U$ and $TU \div U$

To use the ÷ sign



$9 \div 3 = 3$

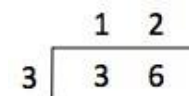
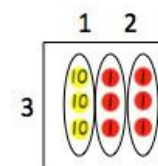
RECOMMENDED BY THE END OF YEAR 2

Stage 3

To use the short division method to divide numbers, initially using **Place Value Counters**. Then move onto finding remainders and then decimals.

Using visual representation

leading to



RECOMMENDED BY THE END OF YEAR 3

Stage 4

To use the short division method to divide 3-digit numbers, including decimals.

$$\begin{array}{r} 137 \\ 3 \overline{) 411} \\ \underline{3} \\ 11 \\ \underline{9} \\ 21 \\ \underline{21} \\ 0 \end{array}$$

$$\begin{array}{r} 108 \text{ r } 1 \\ 5 \overline{) 541} \\ \underline{5} \\ 41 \\ \underline{40} \\ 1 \end{array}$$

RECOMMENDED BY THE END OF YEAR 4

Stage 5

To use long division method to divide 3 and 4-digit numbers by 2-digit numbers

$$\begin{array}{r} 576 \\ 15 \overline{) 8640} \\ \underline{75} \\ 114 \\ \underline{105} \\ 90 \end{array}$$

RECOMMENDED BY THE END OF YEAR 5

Notes

In Year 6, pupils continue practicing formal written methods with increasing large numbers so they become fluent and precise.