



Reeth Community Primary School and Gunnerside
Methodist (VC) Primary School Federation

Calculation Policy for Mathematics



Addition



Subtraction



Multiplication



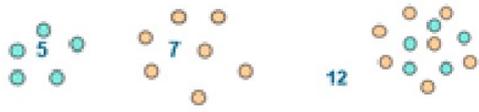
Division



Year 1

Counting and combining sets of objects

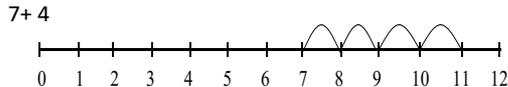
Combining two sets of objects will progress to adding on to a set.



Counting on with a number track



Counting on with a number line



+ and = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equals sign so that it is not just interpreted as 'the answer'.

2 = 1 + 1
2 + 3 = 4 + 1

Missing numbers need to be placed in all possible places.

3 + 4 = □ □ = 3 + 4
3 + □ = 7 7 = □ + 4



Year 2

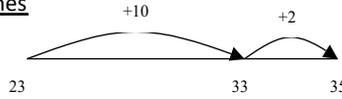
Missing number problems

e.g. 14 + 5 = 10 + □ 32 + □ + □ = 100 35 = 1 + □ + 5

It is valuable to use a range of representations (also see Y1). Continue to use number lines to develop understanding of:

Counting on in tens and ones

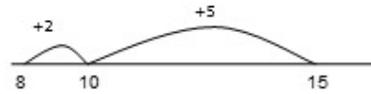
23 + 12 = 23 + 10 + 2
= 33 + 2
= 35



Bridging over multiples of 10

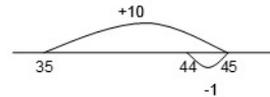
The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.

8 + 7 = 15



Adding 9 or 11 by adding 10 and adjusting by 1

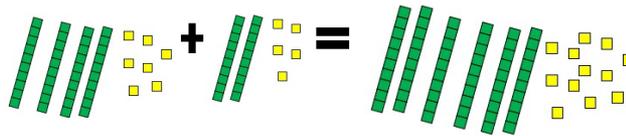
e.g. Add 9 by adding 10 and adjusting by 1
35 + 9 = 44



Towards a written method

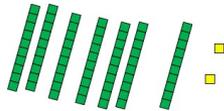
Partitioning in different ways and recombine

47 + 25 = 60 + 12



Leading to exchanging:

72



Expanded written method

40 + 7
+ 20 + 5
60 + 12 = 72



Year 3

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

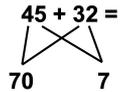
Bridging over multiples of 1, 10 and 100 and 1,000

Bridging over multiples of 10 37 + 4 = 41
Bridging over multiples of 100 280 + 40 = 320
Bridging over 1,000 800 + 500 = 1,300
Bridging over whole numbers 3.6 + 0.8 = 4.4

Progress to trickier numbers 753 + 500 = 1,253
Children need to be secure adding multiples of 10 and 100 to any three-digit number including those that are not multiples of 10.

Partition into tens and ones

Partition both numbers and recombine. $45 + 32 = 77$

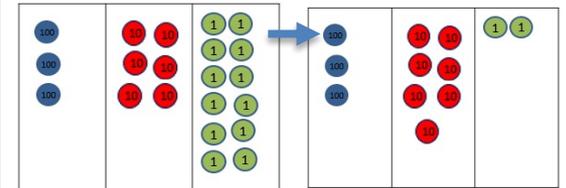


Towards a written method

Introduce expanded column addition modelled with place value counters or Dienes.

200 + 40 + 7 247
100 + 20 + 5 +125
300 + 60 + 12 = 372 12
60
300
372

Leading to children understanding the exchange between tens and ones.



Some children will begin to use a formal columnar algorithm. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

247
+125
372



Year 4

Missing number / digit problems

e.g. $0.95 + \underline{\quad} = 1.05$

Bridging should continue to be developed, building on that covered in Y3.

Bridging over thousands $6,700 + 500 = 7,200$

Progressing to tricky numbers $6,735 + 500 = 7,235$

Bridging over tenths $0.07 + 0.04 = 0.11$

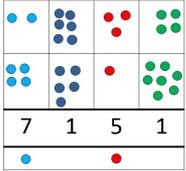
Partitioning

Partition numbers and recombine.

$$\begin{array}{r}
 450 + 320 = 770 \\
 \begin{array}{c} \diagdown \quad \diagup \\ 700 \quad 70 \end{array}
 \end{array}$$

Column addition

Progressing to 4 digits:



$$\begin{array}{r}
 2634 \\
 + 4517 \\
 \hline
 7151
 \end{array}$$

Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Decimals:

$$\begin{array}{r}
 32.15 \\
 + 19.17 \\
 \hline
 51.32
 \end{array}$$

3 number stack:

$$\begin{array}{r}
 2538 \\
 1254 \\
 + 1734 \\
 \hline
 5526
 \end{array}$$



Year 5

Missing number / digit problems

e.g. $6.995 + \underline{\quad} = 7$

$$\begin{array}{r}
 \square \square 5 \square 7 \\
 + 1237 \\
 \hline
 5764
 \end{array}$$

Bridging should continue to be secured and extended.

Larger numbers $680,000 + 30,000 = 710,000$

Tricky numbers $681,422 + 30,000 = 711,422$

Bridging over hundredths $0.007 + 0.005 = 0.012$

Partitioning

Partition numbers and recombine. Children should practise with increasingly large numbers to aid fluency

e.g. $12462 + 2300 = 14762$

Column addition

Progressing to more than 4 digits:

$$\begin{array}{r}
 351.27 \\
 + 629.30 \\
 \hline
 980.57
 \end{array}$$

Numbers with digits in different place value columns:

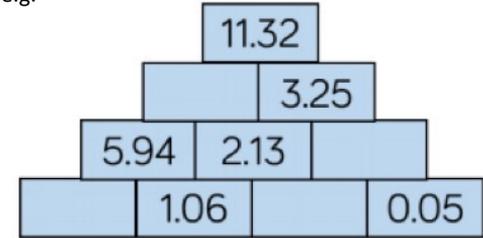
$$\begin{array}{r}
 945.68 \\
 + \quad 2.965 \\
 \hline
 948.645
 \end{array}$$



Year 6

Missing number / digit problems

e.g.



Mental methods should continue to develop, supported by a range of models and images.

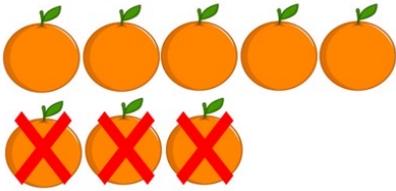
Column addition

As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency.

Year 1

Understand subtraction as taking away:

$8 - 3 = 5$

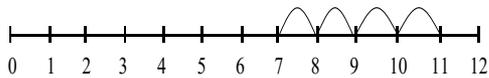


Counting back with a number track



Counting back with a number line

$11 - 4$



Understand subtraction as finding the difference:

$8 - 5 = 3$

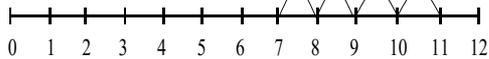


Find the difference with a number track



Find the difference with a number line

$11 - 7$



Missing numbers need to be placed in all possible places.

$7 - 4 = \square$

$\square = 7 - 4$

$7 - \square = 3$

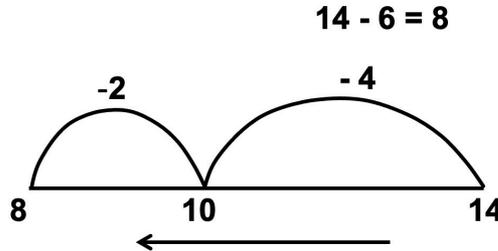
$3 = \square - 4$

Year 2

Missing number problems

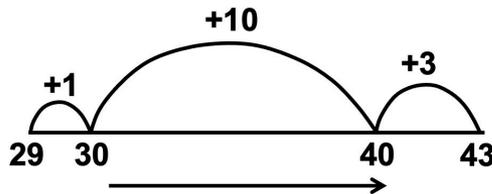
e.g. $52 - 8 = \square$ $\square - 20 = 25$ $22 = \square - 21$ $6 + \square + 3 = 11$

Bridging back over multiples of 10



Find the difference

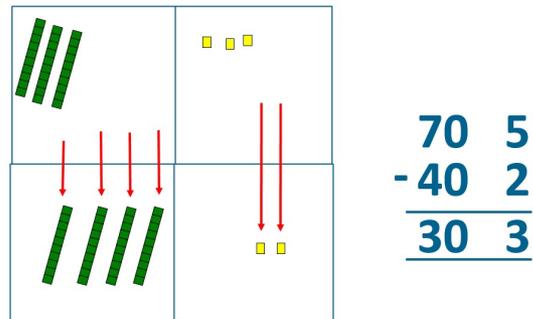
$43 - 29 = 14$



Towards a written method

Recording addition and subtraction in expanded columns can support understanding of the quantity aspect of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes apparatus.

e.g.. $75 - 42$



Year 3

Missing number problems

e.g. $\square = 43 - 29$ $145 - \square = 138$ $245 - \square = 195$
 $532 - 200 = \square$ $\square - 25 = 198$ $\square - 60 = 152$

Mental methods should continue to develop, supported by a range of images. Children should decide whether to use bridging back or find the difference.

Bridging back over multiples of 1, 10 and 100

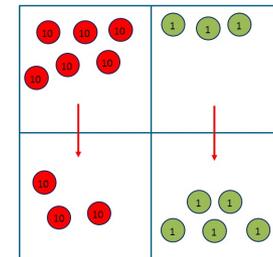
Bridging back over multiples of 10 $41 - 4 = 37$
 Bridging back over multiples of 100 $250 - 70 = 180$
 Bridging back over whole numbers $3.3 - 0.8 = 2.5$
 Progress to trickier numbers $723 - 50 = 673$

Find the difference

e.g. $231 - 198 = 33$ $6.4 - 5.8 = 0.6$

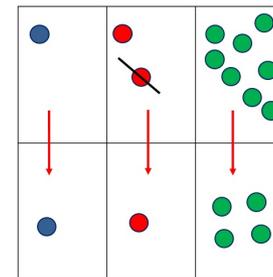
Towards a Written Method

Introduce expanded column subtraction with no decomposition, modelled with place value counters or Dienes



$$\begin{array}{r} 90 \quad 8 \\ - 30 \quad 5 \\ \hline 60 \quad 3 \end{array}$$

Explore exchanging, using counters or Dienes.



$$\begin{array}{r} 232 \\ - 114 \\ \hline 118 \end{array}$$

Some children will begin to use a formal columnar algorithm. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Year 4

Missing number problems

e.g. $200 - 90 - 80 = \square$ $225 - \square = 150$
 $3,450 - 1,000 = \square$ $\square - 2,000 = 900$ $1,025 - \square = 998$

Mental methods should continue to develop, supported by a range of models and images, including the number line.

Bridging back

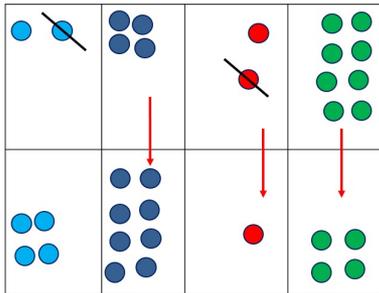
Bridging back over thousands $6,300 + 500 = 5,800$
 Progressing to tricky numbers $6,335 + 500 = 5,835$
 Bridging back over tenths $0.55 + 0.09 = 0.46$

Find the difference

e.g. $2,200 - 1,900 = 300$ $2.54 - 1.98 = 0.56$

Decomposition

Progressing to 4 digits:



$$\begin{array}{r} 6232 \\ - 4814 \\ \hline 1418 \end{array}$$

Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Decimals:

$$\begin{array}{r} 15.75 \\ - 18.40 \\ \hline 17.35 \end{array}$$

Year 5

Missing number problems

$1,000,000 - \square = 999,000$ $12,462 - 2,300 = \square$ $7,325 - 400 = \square$

Mental methods should continue to develop, supported by a range of models and images, including the number line.

Bridging back

Larger numbers $620,000 - 30,000 = 590,000$
 Tricky numbers $620,422 - 30,000 = 590,422$
 Bridging back over hundredths $0.015 - 0.007 = 0.008$

Find the difference

e.g. $145,000 - 96,000 = 49,000$ $0.541 - 0.53 = 0.011$

Decomposition

Progressing to more than 4 digits:

$$\begin{array}{r} 216.1059 \\ - 18.423 \\ \hline 18.636 \end{array}$$

Tricky numbers (often found in tasks involving money):

$$\begin{array}{r} 39.910 \\ - 9.35 \\ \hline 30.65 \end{array}$$

Year 6

Missing number problems

$$\begin{array}{r} \square 7.2 \square \\ - 19.08 \\ \hline 18.16 \end{array}$$

Mental methods should continue to develop, supported by a range of models and images.

Decomposition

As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency.

Continue calculating with decimals, including those with different numbers of decimal places, adding zeros as required.

e.g. $236.7 - 17.853$

$$\begin{array}{r} 236.700 \\ - 17.853 \\ \hline 218.847 \end{array}$$



Year 1

Counting

Count in multiples of twos, fives and tens.

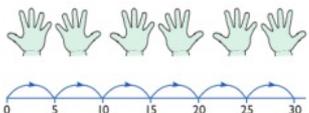
Understand multiplication as repeated addition

Understand multiplication is related to doubling and combining groups of the same size – repeated addition.

Use practical resources for counting – a washing line, concrete objects, Numicon, bundles of straws, bead strings.



$2 + 2 + 2 + 2 + 2 = 10$
 $2 \times 5 = 10$
2 multiplied by 5
5 pairs
5 hops of 2

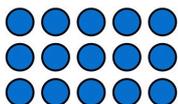


$5 + 5 + 5 + 5 + 5 = 30$
 $5 \times 6 = 30$
5 multiplied by 6
6 groups of 5
6 hops of 5

Use hands on resources to develop the vocabulary relating to multiplication – e.g. pick up five, 4 times

Introduce arrays

Use arrays to understand multiplication can be done in any order.



$$5 \times 3 = 15$$

$$3 \times 5 = 15$$



Year 2

Counting

Count in multiples of twos, threes, fives and tens. Recall facts too.

Express multiplication as a number sentence

Understand that multiplication can be done in any order.

$$5 \times 3 = 15 \quad 3 \times 5 = 15$$

Use understanding of the inverse and practical resources to solve missing number problems.

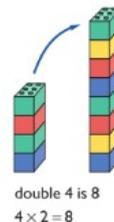
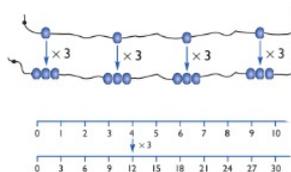
$$7 \times 2 = \square \quad \square = 2 \times 7$$
$$7 \times \square = 14 \quad 14 = \square \times 7$$
$$\square \times 2 = 14 \quad 14 = 2 \times \square$$
$$\square \times \bigcirc = 14 \quad 14 = \square \times \bigcirc$$

Explore arrays

Develop understanding of multiplication using array and number lines (see Year 1). Include multiplications not in the 2, 5 or 10 times tables.

Doubling and scaling

Double numbers up to 10 + 10. Use known doubles and partitioning to double 2 digit numbers (double 15 = double 10 + double 5)



double 4 is 8
 $4 \times 2 = 8$

Begin to develop understanding of multiplication as scaling (3 times bigger/taller)

Towards a written method

Use jottings to develop an understanding of doubling two digit numbers.

$$16 \times 2 = 32$$
$$10 \times 2 = 20 \quad 6 \times 2 = 12$$



Year 3

Counting

Count in multiples of 2, 3, 4, 5, 8, 10, 50 and 100. Recall multiplication facts for the 2, 3, 4, 5, 8 and 10 times tables.

Missing number problems

Continue with a range of equations as in Year 2 but with appropriate numbers.

$$8 \times 7 = \square \quad \square = 7 \times 8$$
$$8 \times \square = 56 \quad 56 = \square \times 8$$
$$\square \times 7 = 56 \quad 56 = 7 \times \square$$
$$\square \times \bigcirc = 56 \quad 56 = \square \times \bigcirc$$

Mental multiplication with partitioning

Double 2 digit numbers using partitioning.
 $14 \times 2 = 10 \times 2$ and $4 \times 2 = 20$ and $8 = 28$

Multiplication with multiples of 10 and tenths

Explore multiplication of multiples of 10 and tenths.

e.g.

$$3 \times 7 = 21$$

$$3 \times 7 = 21$$

$$30 \times 7 = 210$$

$$0.3 \times 7 = 2.1$$

$$30 \times 70 = 2,100$$

(Note that pupils learn about hundredths in Y4)

Towards a written method

Extend the mental methods above to record partitioning of trickier numbers:

e.g.

$$23 \times 5 =$$

$$20 \times 5 = 100$$

$$3 \times 5 = 15$$

$$100 + 15 = 115$$

Some Year 3 pupils may be ready to use short multiplication – see Year 4.



Year 4

Counting

Count in multiples of 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 50, 100 and 1000. Count in tenths and hundredths.

Recall multiplication facts up to 12×12 .

Missing number problems

Continue with a range of equations as in Year 2 & 3 but with appropriate numbers. Also include equations with missing digits:

$$\square \times 5 = 160$$

Multiplication with multiples of 10 and 100 and tenths and hundredths

e.g.

$$3 \times 7 = 21$$

$$30 \times 7 = 210$$

$$30 \times 70 = 2,100$$

$$300 \times 7 = 2,100$$

$$3 \times 7 = 21$$

$$0.3 \times 7 = 2.1$$

$$0.3 \times 0.7 = 0.21$$

$$0.03 \times 7 = 0.21$$

(Note that pupils learn about thousandths in Y5)

Short multiplication

Make connections with previous learning of column addition and decomposition.

	3	2	1	7
x			2	3
<hr/>				
	9	6	5	1

Include decimal numbers:

	4	2	0	6	4
x		1	3	2	5
<hr/>					
	2	1	3	2	0



Year 5

Counting

Consolidate times tables knowledge. Count in thousandths.

Count in other multiples of numbers like 15 and 75.

Multiplication with multiples of 10, 100 and 1,000 and tenths, hundredths and thousandths

e.g.

$$3 \times 7 = 21$$

$$30 \times 7 = 210$$

$$30 \times 70 = 2,100$$

$$300 \times 70 = 21,000$$

$$3 \times 7 = 21$$

$$0.3 \times 7 = 2.1$$

$$0.3 \times 0.7 = 0.21$$

$$0.03 \times 7 = 0.21$$

$$0.03 \times 0.7 = 0.021$$

Complete missing number questions with this knowledge.

$$\square \times 7 = 2,100$$

Other mental skills and knowledge

Use practical resources and jottings to explore equivalent statements (e.g. $4 \times 35 = 2 \times 2 \times 35$).

Identify factor pairs for numbers.

Recall prime numbers up to 50 and identify prime numbers up to 100.

Short multiplication

Progressing to more than 4 digits:

	3	5	2	0	6	5
x	1	0	1	1	3	
<hr/>						
	1	0	5	7	9	5

Long multiplication

Begin with straightforward calculations.

		3	2	7	
x		1	3	5	
<hr/>					
		1	6	3	5
+		3	2	7	0
<hr/>					
		4	9	0	5



Year 6

Counting

Continue to practise times tables knowledge. Count in thousandths. Count in other multiples of numbers like 15 and 75.

Multiplication with multiples of 10, 100 and 1,000 and tenths, hundredths and thousandths

See Y5.

Other mental skills and knowledge

Use practical resources and jottings to explore equivalent statements (e.g. $4 \times 35 = 2 \times 2 \times 35$).

Identify factor pairs for numbers.

Recall prime numbers up to 50 and identify prime numbers up to 100.

Short multiplication

Extend to deal with tricky number situations like 23.6×0.6

Work with 6 instead of 0.6

		2	3	0	6
x		2	3	6	
<hr/>					
		1	4	1	6

Divide the answer by 10.
 $141.6 \div 10 = 14.16$

Long multiplication

Develop fluency with long multiplication.

			7	3	3	6		
			x	+	+	1	2	4
<hr/>								
			2	9	3	4	4	
+		1	4	6	7	2	0	
<hr/>								
		1	7	6	0	6	4	



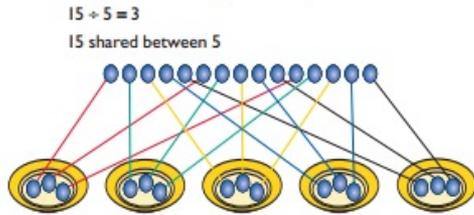
Year 1

Counting

Children must have secure counting skills – being able to confidently count in twos, fives and tens. Children should be given opportunities to reason about what they notice in number patterns.

Sharing

Children should be taught to share using concrete apparatus. Sharing develops one-to-one correspondence.



Grouping

Children should apply their counting skills to develop understanding of grouping.



Use of arrays as a pictorial representation for division.

$15 \div 3 = 5$ There are 5 groups of 3.

$15 \div 5 = 3$ There are 3 groups of 5.



Children should learn to find $\frac{1}{2}$ and $\frac{1}{4}$ of simple objects, numbers and quantities.



Year 2

Counting

Learn to recall the associated division facts for the 2, 5 and 10 times tables.

Missing numbers

$$6 \div 2 = \square \quad \square = 6 \div 2$$

$$6 \div \square = 3 \quad 3 = 6 \div \square$$

$$\square \div 2 = 3 \quad 2 = \square \div 3$$

$$\square \div 3 = 2 \quad 2 = 6 \div \square$$

Sharing and grouping

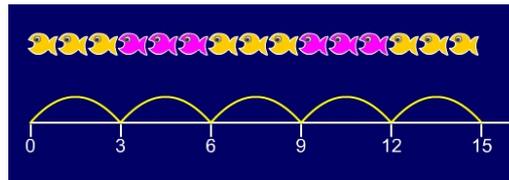
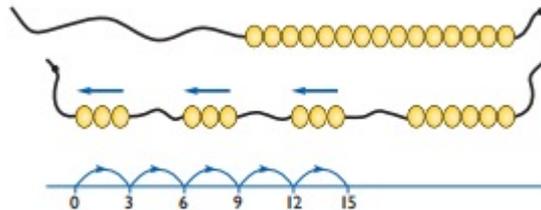
Know and understand sharing and grouping – introducing children to the \div sign.

Children should continue to use grouping and sharing for division using practical apparatus, arrays and pictorial representations.

Grouping using a numberline

Group from zero in jumps of the divisor to find our 'how many groups of 3 are there in 15?'

$$15 \div 3 = 5$$



Continue work with arrays. Support children to understand how multiplication and division are inverse. Look at an array – what do you see?



Year 3

Counting

Recall division facts for the 2, 3, 4, 5, 8 and 10 times tables.

Missing numbers

Continue using a range of equations as in year 2 but with appropriate numbers.

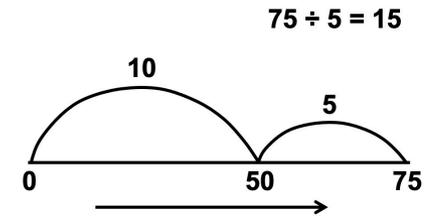
$$24 \div 4 = \square \quad \square = 24 \div 4$$

$$24 \div \square = 6 \quad 6 = 24 \div \square$$

$$\square \div 4 = 6 \quad 4 = \square \div 6$$

$$\square \div 6 = 4 \quad 4 = 24 \div \square$$

Towards a written method



Some pupils will begin to use a more efficient version of the number line. At school we call this a *What I know line*.

$$75 \div 5 = 15$$

1	5
10	50
5	25
15	75

Remainders

Children learn to complete calculations that involve remainders.

e.g.

$$49 \div 4 = 12 \text{ r}1$$

