Woolton Primary School

Calculation Policy 2023-26

Learning Together ...Achieving Together!

Addition

Written methods for addition of whole numbers

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for addition which they know they can rely on when mental methods are not appropriate. These notes show the stages in building up to using an efficient written method for addition of whole numbers by the end of Year 4.

To add successfully, children need to be able to:

- **recall all addition pairs to 9 + 9 and complements in 10;**
- **add mentally a series of one-digit numbers, such as 5 + 8 + 4;**
- **add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value;**
- **partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways.**

Note: *It is important that children's mental methods of calculation are practised on a regular basis and secured alongside their learning and use of an efficient written method for addition.*

Using and Applying

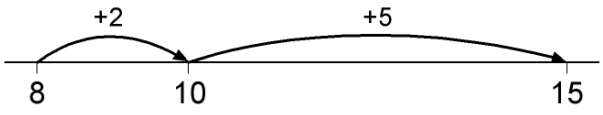
Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures)

ADDITION *Following on from number line/number track work*

Stage 1: The empty number line

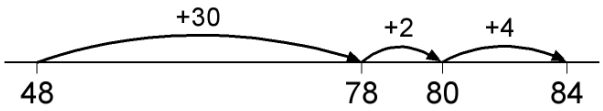
Steps in addition can be recorded on a number line. The steps often bridge through a multiple of 10.

8 + 7 = 15



Year 2

48 + 36 = 84



Year 3

or:

Year 3

Stage 2: Partitioning

Record steps in addition using partitioning:

76 + 47 = 76 + 40 + 7 = 116 + 7 = 123

76 + 47 = 70 + 40 + 6 + 7 = 110 + 13 = 123

Partitioned numbers are then written under one another: Year 3

$$\begin{array}{rcl} 47 & = & 40 + 7 \\ +\,76 & & 70 + 6 \\ \hline & & 110 + 13 = 123 \end{array}$$

or in a grid

40	7
70	6
110	13

Stage 3: Expanded method in columns

Write the numbers in columns.

Adding the tens first to follow on from Partitioning

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 110 \\ 13 \\ \hline 123 \end{array}$$

Moving on to Adding the ones first:

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 13 \\ 110 \\ \hline 123 \end{array}$$

Year 3

Discuss how adding the ones first gives the same answer as adding the tens first. Refine over time to adding the ones digits first consistently.

Stage 4: Column method (efficient)

Ask children to estimate first.

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 123 \\ 1\,1 \end{array} \qquad \begin{array}{r} 258 \\ +\ 87 \\ \hline 345 \\ 1\,1 \end{array} \qquad \begin{array}{r} 366 \\ +458 \\ \hline 824 \\ 1\,1 \end{array}$$

Year 4

Children need to have experience of adding more than two numbers.

Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable.

Written methods for subtraction of whole numbers

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for subtraction which they know they can rely on when mental methods are not appropriate.

These notes show the stages in building up to using an efficient method for subtraction of up to 5 whole numbers by the end of Year 5.

To subtract successfully, children need to be able to:

- **recall all addition and subtraction facts to 20;**
- **subtract multiples of 10 (such as 160 – 70) using the related subtraction fact,16 – 7, and their knowledge of place value;**
- **partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).**

Note: *It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.*

Using and Applying

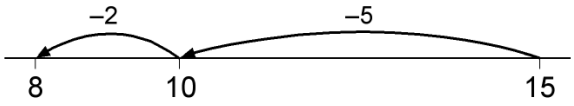
Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures).

SUBTRACTION *Following on from number line /numeral track*

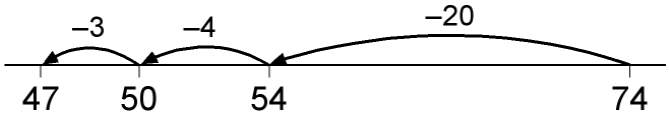
Stage 1: Using the empty number line

(To be introduced before counting-up) Steps in subtraction can be recorded on a number line. The steps often bridge through a multiple of 10.

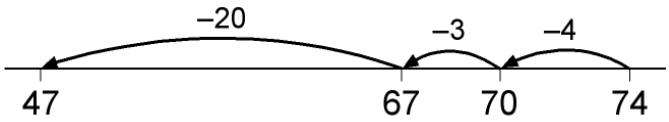
15 – 7 = 8



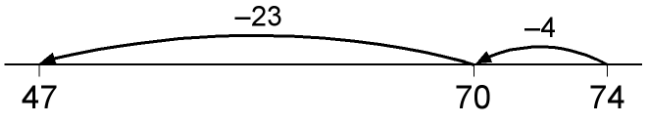
74 – 27 = 47 worked by counting back:



The steps may be recorded in a different order:



or combined:



Year 2 and Year 3

Building on mental strategies of:

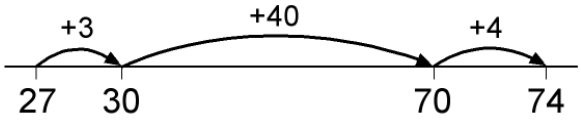
Counting **back to**

and

Counting **back from**

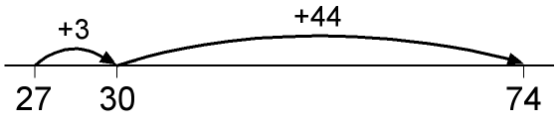
Either order is acceptable

The counting-up method



2 2/3 digits

or:



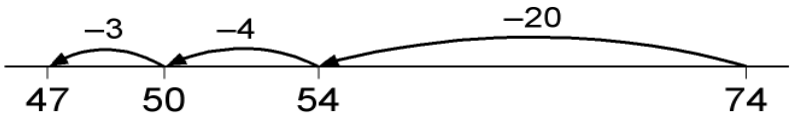
Year 2/Year 3/Year 4/Year 5 – 3/4 digit numbers

With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28.

Stage 2: Partitioning

Using the 'Jump' strategy. Retain the first number and partition the second 74 – 27 = 74 – 20 – 7 = 54 – 7 = 47

This requires children to subtract a single-digit number or a multiple of 10 from a two-digit number mentally. The method of recording links to counting back on the number line.



Stage 3: Expanded layout, leading to column method

Partitioned numbers are then written under one another:

563 – 241

500	60	3
200	40	1
300	20	2

322 ➔ leads to

$$\begin{array}{r} 563 \\ -\ 241 \\ \hline 322 \end{array}$$

up to 3 digits Year 4, Year 5 up to 5 digits

Example: 74 – 27

70	4
20	7

➔

60

70	14
20	7
40	7

leads to

$$\begin{array}{r} {}^{6}\not{7}\,{}^{1}\not{4} \\ -\ 27 \\ \hline 47 \end{array}$$

Stage 4: column method (efficient)

Ask children to estimate first.

$$\begin{array}{r} {}^{5}\not{6}\,{}^{1}3 \\ -248 \\ \hline 315 \end{array}$$

Year 5 up to five digits

Multiplication

Written methods for multiplication of whole numbers

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for multiplication which they know they can rely on when mental methods are not appropriate.

These notes show the stages in building up to using an efficient method for by the end of Year 4, two-digit by two-digit multiplication by the end of Year 5, and three-digit by two-digit multiplication by the end of Year 6.

To multiply successfully, children need to be able to:

- **recall all multiplication facts to 12 × 12;**
- **partition number into multiples of one hundred, ten and one;**
- **work out products such as 70 × 5, 70 × 50, 700 × 5 or 700 × 50 using the related fact 7 × 5 and their knowledge of place value;**
- **add two or more single-digit numbers mentally;**
- **add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value;**
- **add combinations of whole numbers using the column method (see above).**
- **Using short multiplication to multiply a 1 digit number bu a number with up to four digits**
- **And use long multiplication to multiply 3 digit and four digit numbers by a number between 11 – 20 by the end of Year 5.**
- **Use long multiplication to multiply a two digit number with up to four digits**
- **Use short multiplication to multiply a one digit number by a number with one or two decimal places including money.**

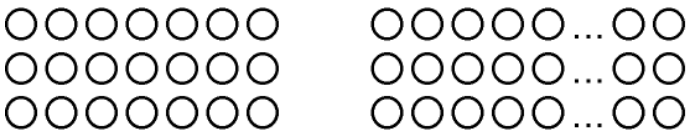
Note: *It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.*

Using and Applying

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures).

Stage 1: Mental multiplication using partitioning *(towards informal)*

Year 3, for example when they use their knowledge of the 2, 5 and 10 times tables to work out multiples of 7:



Year 2

$$7 \times 3 = (5+2) \times 3 = (5 \times 3) + (2 \times 3) = 15 + 6 = 21$$

This would be done through questioning during practical activities with counting equipment

"You have shown me 5 lots of 3. If I needed to know what 7 lots of 3 is, what could I do?"

Stage 2: The grid method (partitioning)

38 x 7 =

x	7
30	210
8	56
	266

Year 4

56 x 27 =

x	20	7	
50	1000	350	1350
6	120	42	162
			1512

Year 4

Year 3:

2+3 digits by 3, 4, 5, 6

Stage 3: Efficient multiplication

Ask children to estimate first.

38 x 7 is approximately

40 x 7 = 280

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

Up to 4 digits

Year 5

56 × 27 is approximately

60 × 30 = 1800

$$\begin{array}{r} 56 \quad \boxed{3+4} \\ \times \quad 27 \quad \boxed{11-20} \\ \hline 1120 \\ 392 \\ \hline 1512 \\ 1 \end{array}$$

56×20

56×7

or

$$\begin{array}{r} 56 \\ \times \quad 27 \\ \hline 392 \\ 1120 \\ \hline 1512 \\ 1 \end{array}$$

56 x 7

56 x 20

Discuss order as with column addition.

Written methods for division of whole numbers

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for division which they know they can rely on when mental methods are not appropriate.

These notes show the stages in building up to long division through Years 3 to 6 – first long division TU ÷ U, extending to HTU ÷ U, then HTU ÷ TU, and then short division HTU ÷ U.

To divide successfully in their heads, children need to be able to:

- **understand and use the vocabulary of division – for example in 18 ÷ 3 = 6, the 18 is the dividend, the 3 is the divisor and the 6 is the quotient;**
- **partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways;**
- **recall multiplication and division facts to 10 × 10, recognise multiples of one-digit numbers and divide multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value;**
- **know how to find a remainder working mentally – for example, find the remainder when 48 is divided by 5;**
- **understand and use multiplication and division as inverse operations.**

Note: *It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division.*

To carry out written methods of division successful, children also need to be able to:

- understand division as repeated subtraction;
- estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- multiply a two-digit number by a single-digit number mentally;
- subtract numbers using the column method.

Using and Applying

Before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts (including money, time and other measures).

Stage 1: Sharing

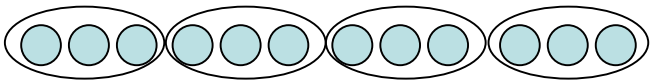
Children work practically in one to one sharing activities. They understand that they are sharing equally so that each group has the same amount

Sharing 12 cakes equally between 3

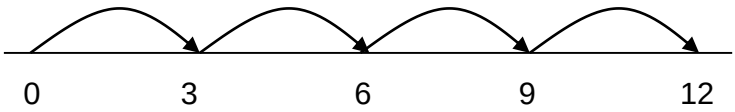
Year 1/Year 2

Stage 2: Grouping

Children work practically in grouping activities, moving onto representing this using a number line



How many threes are there in12?



Year 2

Stage 3: 'Expanded' method through chunking

97 ÷ 9

Year 3

$9\overline{)97}$

$-\ 90$ $\quad 9\times10$

7

Answer: $\quad 10\,\mathrm{R}\,7$

196 ÷ 6

Year 4

$6\overline{)196}$

$-\ 60$ $\quad 6\times10$

136

$-\ 60$ $\quad 6\times10$

76

$-\ 60$ $\quad 6\times10$

16

$-\ 12$ $\quad 6\times\ 2$

$4 \qquad 32$

Answer: $\quad 32\,\mathrm{R}\,4$

Stage 4: Long division

$$24\overline{)560}$$

$20 - 480$ $\quad 24 \times 20$

80

$3 \quad 72$ $\quad 24 \times 3$

8

Year 5/Year 6

Answer: 23 R 8

In effect, the recording above is the long division method, though conventionally the digits of the answer are recorded above the line as shown below.

$$\begin{array}{r} 23 \\ 24\overline{)560} \\ -480 \\ \hline 80 \\ -72 \\ \hline 8 \end{array}$$

Answer: 23 R 8

Stage 5: Short division

The short division method is recorded like this:

$$\begin{array}{r} 2\ 7 \\ 3\overline{)8\ {}^{2}1} \end{array}$$

The carry digit '2' represents the 2 tens that have been exchanged for 20 ones

$$\begin{aligned} 291 \div 3 &= (270 + 21) \div 3 \\ &= (270 \div 3) + (21 \div 3) \\ &= 90 + 7 \\ &= 97 \end{aligned}$$

Year 5
4 digits ≤ 12

Year 6
Four digits any 1 or 2 digits

This is then shortened to:

$$\begin{array}{r} 9\ 7 \\ 3\overline{)2\ 9\ {}^{2}1} \end{array}$$