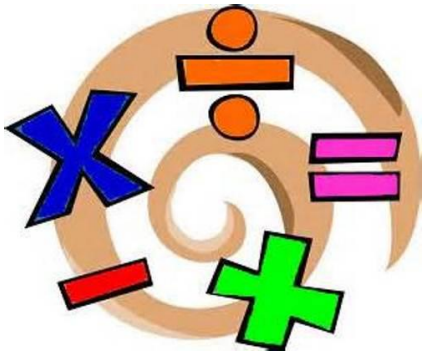
# Culworth and Boddington CE Primary Academies

## Calculation handbook for parents with children in Year 3



# Progression towards standard written methods of calculation

INTRODUCTION

This calculation handbook has been written in line with the school calculation policy and the programmes of study taken from the revised National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression for each year group. The content is set out in yearly blocks under the following headings: addition, subtraction, multiplication and division.

Statements taken directly from the programme of study are listed in italics at the top of each section.

The Federation of Culworth and Boddington C of E Primary Academies uses the Big Maths resources to teach mental calculation strategies, including the key number facts that children will need to know called 'learnits.'

Children will use mental methods as their first port of call, when appropriate, but for calculations they cannot do in their heads, they will need to use an efficient method accurately and with confidence.

Within school, children will be given opportunities to deepen their understanding of concepts through a range of problems and real life situations, rather than moving on to the content of the next year group.

*"Decision about when to progress should always be based on the security of pupils understanding and their readiness to progress to the next stage."*

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AIMS OF THE HANDBOOK

- To enable parents to have a secure knowledge and understanding of the informal (mental) and formal written methods of calculations for all four operations taught in school.

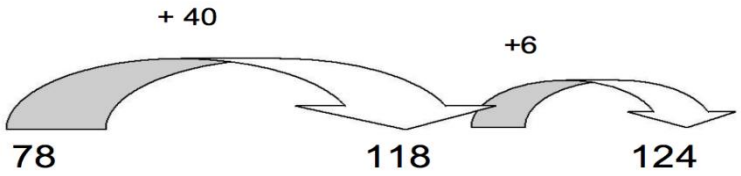
# Year 3

**Addition – Year 3**

- *Add numbers with up to three digits, using formal written methods of columnar addition*

NB Ensure that children are confident with the methods outlines in the previous year's guidance before moving on.

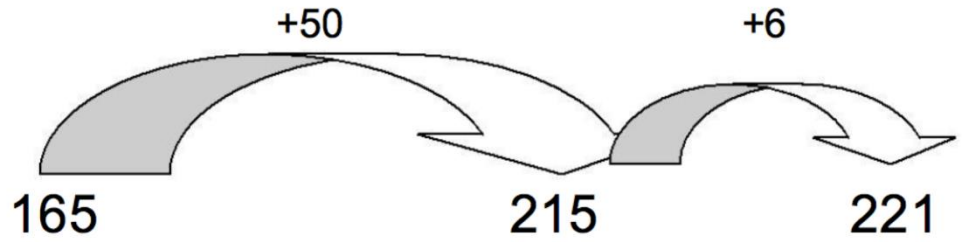
78 + 46 = 124




Use a 200 grid to support counting on in tens and bridging 100 ….

… and with addition of a three-digit and a two- digit number:

165 + 56 = 221




Further develop the partition method with calculations that bridge 100:

85 + 37 = 80 + 5 + 30 + 7

80 + 30 = 110

5 + 7 = 12

110 + 12 = 122

85 + 37 = 122

The partitioning methods can also be used with three- digit numbers.

Introduce the expanded written method with the calculation presented both horizontally and vertically (in columns).

Initially use calculations where it has not been necessary to bridge across the tens or hundreds:

63 + 32 = 95

60 + 3

\+ 30 + 2

90 + 5 = 95

' Partition the numbers into tens and ones/units. Add the tens together and then add the ones/units together. Recombine to give the answer.'

Then ….

Add the least significant digits (units) together first and then the tens in preparation for the written method.

```
   76
+  47
  ---
   13 (7+6)
  110 (70+ 40)
  ---
  123
```

If children are ready introduce the formal written method

```
   23
+  15
  ---
   38
```

Then moving onto 'carry" across the columns and bridge 10 or 100.

76 + 47 =

76

\+ 47

123

1 1

Use the language of place value to ensure understanding:

"Seven add six equals 13". Write three in the units column and 'carry' one (10) across into the tens column. 'Add 40 and 70 and then 10 that we 'carried" equals 120'. Write 20 in the tens column and 'carry' one (100) across into the hundred column (100).

The digits that have been 'carried' should be recorded under the line in the correct column.

Further develop with addition of a three- digit number and a two-digit number and three-digit number and a three-digit number.

178 + 43 =

178

\+ 43

221

1 1

686 + 549

686

\+ 549

1235

11

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

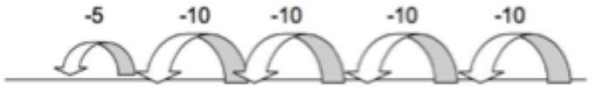
**Subtraction – Year Three**

- *Subtract numbers with up to three digits, using formal written methods of columnar subtraction*

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Further develop the use of the empty number line with calculations that bridge 100:

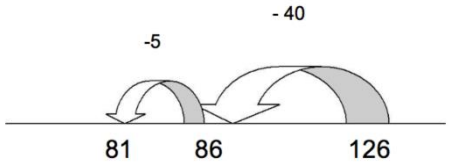
126 – 45 = 81




81 86 96 106 116 126

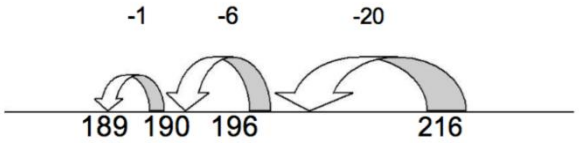
Use a 200 grid to support counting back in tens and bridging 100.

Then use more efficient jumps:



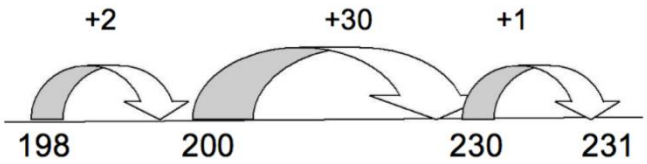
Extend with larger numbers by counting back …

216 – 27 = 189




… and by counting on to find the difference (small difference):

231 – 198 = 33




'The difference between 198 and 231 is 22.'

Introduce the expanded written method with the calculation presented both horizontally and vertically (in columns). Use two-digit numbers when introducing this method, initially:

78 – 23 = 55

'Partition numbers into tens and ones/units. Subtract the ones, and then subtract the tens. Recombine to give the answer.'

$$\begin{array}{r} 70 + 8 \\ -\ 20 + 3 \\ \hline 50 + 5 \end{array}$$

NB In this example decomposition (exchange) is not required.

You might replace the + sign with the word 'and' to avoid confusion, or omit completely.

This will lead to the formal written method:

$$\begin{array}{r} 78 \\ -\ 23 \\ \hline 55 \end{array}$$

Use the language of place value to ensure understanding:

'Eight subtract three, seventy subtract twenty.'

NB A number line would be an appropriate method for this calculation but use two-digit numbers to illustrate the formal written method initially.

Introduce the expanded written method where exchange/decomposition is required:

73 – 27 =

| | | | | | |
|---|---|---|---|---|---|
| | 70 + 3 | | | 60 + 13 | 73 is partitioned into 60 + 13 |
| | | Becomes | | | |
| - | 20 + 7 | | - | 20 + 7 | in order to calculate 72 – 27 |
| | | | | 40 + 6 = 46 | |

NB children will need to practise partitioning numbers in this way. Base – ten materials (dienes) could be used to support this.

When children are confident with the expanded method introduce the formal written method, involving decomposition/exchange:

73 – 27 =

6 13

~~7~~ 3

- 2 7

4 6

Use the language of place value to ensure understanding.

'We can't subtract seven from three, so we need to exchange a ten for ten ones to give us 60 + 13.'

Use base ten material to support understanding.

Then they use the same methods as above extending to 3- digit number subtract a 2-digit number and a three-digit number subtract a three-digit number.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

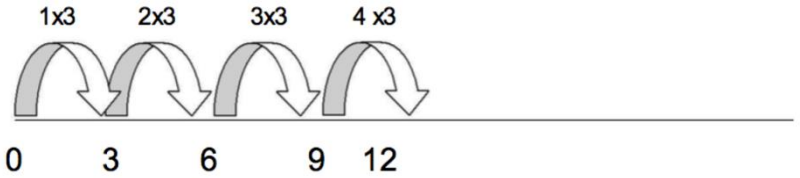
**Multiplication – Year 3**

- *Recall and use multiplication facts for the 3,4,5 and 8 multiplication tables (continue to practices the 2,5 and 10 multiplication tables)*
- *Write and calculate mathematical statements for multiplication using the multiplication table that they know, including for 2-digit number lines one-digit numbers, using mental and progressing to a formal written method*

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use number lines and arrays to support multiplication, as appropriate (see Y2 guidance).

4 x 3 =12



Partitioning method for multiplication of a 'teens' number by a one-digit number.

13 x 5 = 65  (partition 13 into 10 and 3)

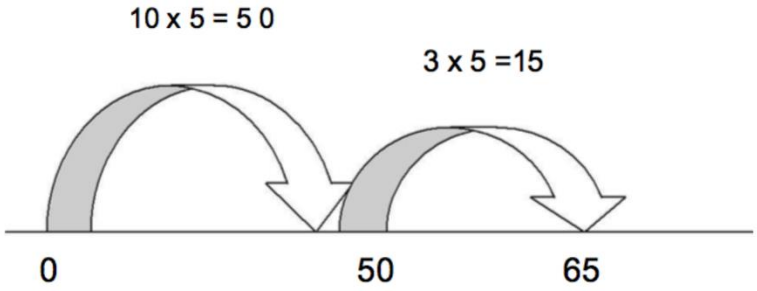
10 x 5 = 50

3 x 5 = 15

50 + 15 = 65

Demonstrate the partitioning method using a number line:

13 x 5 = 65



Grid Method (teen number multiplied by a one-digit number):

13 x 8 = 104

| x | 10 | 3 |
|---|---|---|
| 8 | 80 | 24 |

80 + 24 = 104

'Partition 13 into 10 + 3 then multiply each number by 8. Add the partition products (80 and 24) together. '

This will lead into expanded short multiplication:

13 x 8 = 104

10 + 3
x 8
24 (3 x 8)
+ 80 (10 x 8)
104

Include an addition symbol when adding partial products.

Refine the recording in preparation for formal short multiplication:

13 x 8 = 104

Use the language of place value to ensure understanding.

Include an addition symbol when adding partial products.

```
  13
x  8
  24 (3 x8)
+80 (10 x 8)
 104
```

Model the same calculation using a number line, if necessary, to ensure understanding.

Formal short multiplication:

$$\begin{array}{r} 1\ 3 \\ \times\ 8 \\ \hline 1\ 0\ 4 \\ \hline 2 \end{array}$$

Ensure that the digit 'carried over' is written under the line in the correct column.

Use the language of place value to ensure understanding.

Continue to develop the formal written method of multiplication throughout year 3 using teen numbers by a one-digit number.

If children are confident progress to multiplying other two – digit numbers by a one- digit number (see year 4 guidance)

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

**Division - Year 3**

- *Recall and use multiplication and division facts for the 3, 4, and 8 multiplication tables (continue to practice the 2, 5, and 10 multiplication tables)*
- *Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, using mental and progressing to a formal written method.*

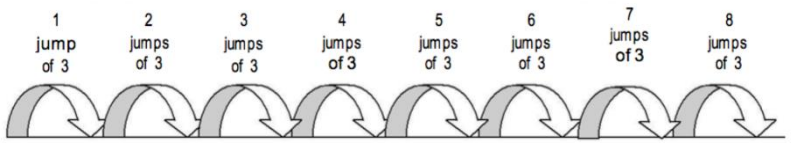
NB Ensure that children are confident with the methods outline in the previous year's guidance before moving on.

Continue to use practical resources, pictures, diagrams, number lines, arrays and the ÷ sign to record, using multiples that they know, as appropriate (year 2 guidance).

Use empty number lines to count forwards…

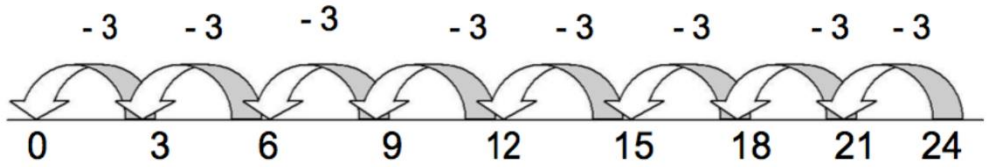
24 ÷ 3 = 8

'How many threes in 24?'




0 3 6 9 12 15 18 21 24

… also jump back from 24 to make the link with repeated subtraction.




'How many groups of three in 24?'

Introduce the formal layout using multiplication/division facts that the children know:

24 ÷ 3 = 8

This can also be recorded as …

$$3\overline{)24}\quad 8$$

'Twenty four divided by three equals eight.'

'How many threes are there in twenty four?'

NB If, at any time, children are making significant errors, return to the previous stage in calculation.