Welbeck Primary School

Mathematics
KS2 Calculation Policy

Reviewed Summer 2024

KEY STAGE 2
WRITTEN CALCULATION METHODS

Addition and Subtraction

Year 3 Objectives

- add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems …… more complex addition and subtraction.

Year 4 Objectives

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

Year 5 Objectives

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

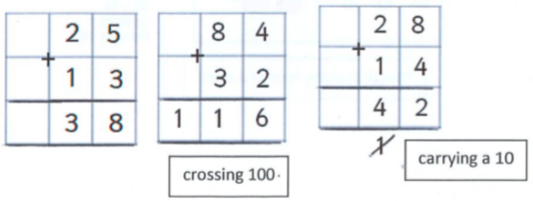
Year 6 Objectives

- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

KEY STAGE 2
WRITTEN CALCULATION METHODS

Addition Progression

Column addition (Y2/Y3)



Column Addition (Y3 onwards)

```
  7 8 9
+ 6 4 2
-------
  1 4 3 1
-------
  1 1
```

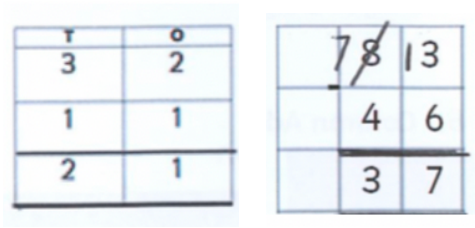
Column Addition with decimals (Y5/Y6)

124.9 + 117.25 = 242.15

```
  1 2 4 . 9 0
+ 1 1 7 . 2 5
-------------
  2 4 2 . 1 5
-------------
  1 1
```

Column subtraction (Y2/Y3)

32 – 11 = **83 – 46 =**



Co

onwards)

```
    8  12 1
    9  3  2
-   4  5  7
-----------
    4  7  5
-----------
```

```
  2 2 . 3 10
- 1 9 . 2 8
-----------
  0 3 . 2 2
-----------
```


KEY STAGE 2
WRITTEN CALCULATION METHODS

Multiplication and Division

Year 3

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Year 4

- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Year 5

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non- prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- 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
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

Year 6

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- 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
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

KEY STAGE 2
WRITTEN CALCULATION METHODS

Multiplication Progression

Multiplication (Y2/Y3)
Partitioning using the grid method
32 x 3 = 96

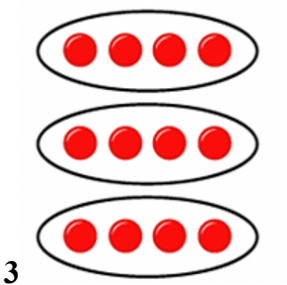
Short multiplication

Long Multiplication

Division Progression

Division as sharing (Y2)

12 ÷ 4 =



3

Bus stop division

98 ÷ 7 =

$$\begin{array}{r} 1\ 4 \\ 7\overline{)9^{2}8} \end{array}$$

98 ÷ 7 =

$$\begin{array}{r} 0\ 8\ 6\ r2 \\ 5\overline{)4\ 3^{3}\ 2} \end{array}$$

Division

$$\begin{array}{r} 4\ 2 \\ 19\overline{)7\ 9^{3}8} \end{array}$$

1x = 19
2x = 38
3x = 57
4x = 76
5x = 95
6x = 114
7x = 133
8x = 152
9x = 171
10x = 190

WR **GES**

25% of 88 = 22

Strategy: recognise that 25% is the same as ¼

To find a ¼ = ½ and ½ again

½ of 88 = 44, ½ of 44 = 22

Answer: 22

20% of 3,000 =

Strategy: use understanding of calculating 10% and that 20% is two lots of 10% (doubling)

10% of 3000 = 300

20% of 3000 = 300 x 2 = 600

Answer: 600

28% x 650 =

Strategy: partition 28% into 10%, 10% and 8%.

10% of 650 = 650 ÷ 10 = ***65***

10% of 650 = 650 ÷ 10 = ***65***

8%: 1% of 650 = 650 ÷ 100 = 6.5

8% = 6.5 x 8 = ***52***

Answer: 65 + 65 + 52 = 182

45% of 460 =

Strategy: use understanding that 45% can be partitioned into 4 lots of 10%, and 5%.

10% of 460 = 460 ÷ 10 = 46

40% = 46 x 4 = ***184***

5% = ½ of 10% = ½ of 46 = ***23***

Answer: 184 + 23 = 207

51% of 900 =

Strategy: recognise that 50% is the same as ½

Use understanding of fluency that ½ of 90 = 45, so ½ of 90 ***0*** *= 45* ***0***

½ of 900 = 450

1% = 900 ÷ 100 = 9

Answer: 450 + 9 = 459

17% x £26 =

Strategy: partition 17% into 10% and 7%. Decimalise £26 to £26.00

10% of £26 = 2 6. 0 0 ÷ 10 = ***2.6***

7%: 1% of £26.00 = 2 6. 0 0 ÷ 100 = 0.26

7% = 0.26 x 7 = 1.82

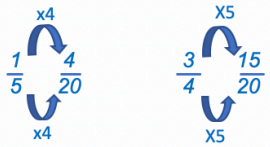
Answer: 2.6 + 1.82 = 4.42

KEY STAGE 2
WRITTEN CALCULATION METHODS: FRACTIONS

Addition/Subtraction

$\frac{1}{5} + \frac{3}{4} =$

Strategy: identify the LCM (lowest common multiple). LCM of 5 and 4 is 20. Convert.

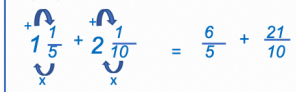


$\frac{4}{20} + \frac{15}{20} = \frac{19}{20}$

Answer: $\frac{19}{20}$

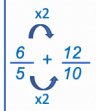
$1\frac{1}{5} + 2\frac{1}{10} =$

Strategy: convert both mixed numbers into improper fractions



$= \frac{6}{5} + \frac{21}{10}$

Next step: identify the LCM (lowest common multiple). LCM of 5 and 10 is 10. Convert.



Next step: add the two improper fractions

$\frac{12}{10} + \frac{21}{10} = \frac{33}{10}$

Answer: $3\frac{3}{10}$ *given as a* ***mixed number***

Multiplication/Division

$\frac{2}{3} \div 3 =$

Strategy: convert the whole number into a fraction ('Top' it)

$\frac{2}{3} \div \frac{3}{1}$

Next step: invert the divisor ('Flip' it)

$\frac{2}{3} \div \frac{1}{3}$

Next step: change ÷ to x

$\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$

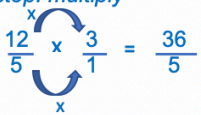
Answer: $\frac{2}{9}$

$2\frac{2}{5} \times 3 =$

Strategy: convert the mixed number into an improper fraction and the whole number 3 into a fraction

$= \frac{12}{5}$ $3 = \frac{3}{1}$

Next step: multiply



$= \frac{36}{5}$

Answer: $7\frac{1}{5}$ ***given as a mixed number***

KEY STAGE 2
WRITTEN CALCULATION METHODS: FRACTIONS

Fraction of an amount

Fraction of an amount

2/3 of 3693 =

Strategy: divide the whole number by the denominator ('bottom') to calculate 1/3. Use the bus-stop method.

```
   1 2 3 1
3 | 3 6 9 3
```

Next step: then multiply this new number by the numerator ('top) to calculate 2/3

```
     1 2 3 1
x          2
-----------
  2 4 6 2
```

Answer: 2462

$\frac{5}{6}$ x **540** =

Strategy: divide the whole number by the denominator ('bottom') to calculate 1/6. Use fluency: if 54÷6 = 9, then

540 ÷ 6 = 90

Next step: then multiply this new number by the numerator ('top) to calculate 5/6

90 x 5 = 450

*Fluency links: 9 x 5 = 45, so 9**0** x 5 = 45**0***

Fraction of an amount

¼ of 1000 =

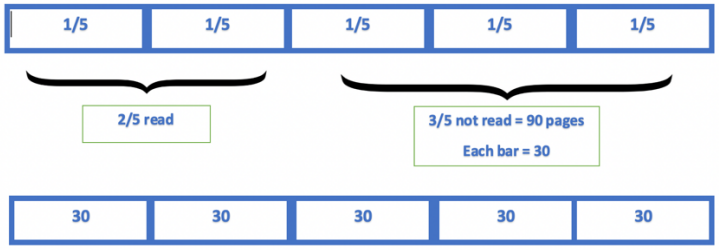
Strategy: recognise that to find a ¼ = ½ and ½ again

½ of 1000 = 500, ½ of 500 is 250.

*Fluency links: ½ of 50 = 25, so ½ of 50**0** = 25**0***

Fractions of an amount/Bar Model

On Saturday Lara read $\frac{2}{5}$ of her book. On Sunday she read the **other** 90 pages to finish the book.
How many pages are there in Lara's book?



Total pages = 30 + 30 + 30 + 30 + 30 = 150

KEY STAGE 2
WRITTEN CALCULATION METHODS: DECIMALS

Multiplying/Dividing decimals

Multiplying/Dividing decimals

3.9 × 30 =

Strategy: use column multiplication.

```
    3 0
  x 3.9
  2 7 0
+ 9 0 0
1 1 7.0
```

3.9 has one decimal place so answer will have one decimal place.

Multiplying/Dividing decimals

15 × 6.1 =

Strategy: use column multiplication.

```
    1 5
  x 6.1
    1 5
+ 9 0 0
  9 1.5
```

6.1 has one decimal place so answer will have one decimal place.

Multiplying/Dividing decimals

73.8 ÷ 6 =

Strategy: use column multiplication.

```
    3 0
  x 3.9
  2 7 0
+ 9 0 0
1 1 7.0
```

3.9 has one decimal place so answer will have one decimal place.

Answer: *117.0*

Multiplying/Dividing decimals

73.8 ÷ 6 =

Strategy: use bus stop division method.

```
  12.3
6 | 73.8
```

Answer: 12.3

Multiplying/Dividing decimals

70 ÷ ☐ = 3.5

Strategy: identify inverse method.

70 ÷ 3.5 = ☐

Next step: multiply both numbers by 10 so that both are whole numbers

700 ÷ 35 =

```
  020
35 | 700
```

Answer: *20*

KEY STAGE 2

WRITTEN CALCULATION METHODS: DECIMALS

Multiplying/Dividing by multiples of 10, 100, 1000

Multiples of 10/100/1000

0.9 ÷ 1 0 0 =

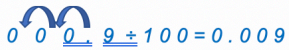
*Strategy: underline and count the zeros (**x2**):*

0 . 9 ÷ 1 0 0 =

Next step: Add in place holders to 0 . 9

0 0 0 . 9 ÷ 1 0 0 =

*Next step: divide by 100 by moving the decimal point **2** places to the left*



0 0 0 . 9 ÷ 1 0 0 = 0 . 0 0 9

***Answer**: 0.009*

Multiples of 10/100/1000

5.014 × 10 =

*Strategy: underline and count the zeros (**x1**):*

5 . 0 1 4 × 1 0 =

*Next step: move the decimal place **one** place to the right using arrows*

5 . 0 1 4 = 5 0 . 1 4

***Answer:** 50.14*

Multiples of 10/100/1000

34.8 × 1,000 =

*Strategy: underline and count the zeros (**x3**):*

3 4 . 8 × 1 0 0 0 =

Next step: Add in place holders

3 4 . 8 0 0

*Next step: move the decimal point **three** place to the right using arrows*

3 4 . 8 0 0 = 3480.0

***Answer:** 3480.0*

Multiples of 10/100/1000

0.9 x 200

Strategy: partition 200 into 100 and 100

0.9 x 100

0.9 x 100

Next step: move decimal point 2 decimal places to the right. Use placeholders

0.9 x 100 = 0 9 0 . 0

0.9 x 100 = 9 0

***Answer:** 90 + 90 = 180*

Multiples of 10/100/1000

343.1 ÷ 1 000 =

*Strategy: underline and count the zeros (**x3**):*

343.1 ÷ 1 0 0 0 =

*Using arrows, move the decimal point **3** places to the left:*

3 4 3 . 1 ÷ 1 0 0 0

= 0.3 4 3

***Answer:** 0.343*