Welbeck Primary School

Mathematics
KS2 Calculation Policy

Reviewed September 2021

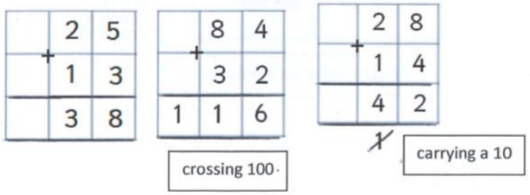
KEY STAGE 2
WRITTEN CALCULATION METHODS

Addition and Subtraction Objectives

Year 3	Year 4 Objectives	Year 5 Objectives	Year 6 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 3- digits using formal written methods of columnar + - • estimate the answer to a calculation and use inverse operations to check answers • solve problems … more complex + -	• add and subtract numbers with up to 4-digits using the formal written methods of columnar + - • 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.	• add and subtract whole numbers with more than 4 digits, including using formal written methods (column + -) • 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 + - multi-step problems in contexts, deciding which operations and methods to use and why.	• 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

Addition Progression: builds upon secured KS1 written calculation methods

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
```

Subtraction Progression: builds upon secured KS1 written calculation methods

Column subtraction (Y2/Y3)

32 – 11 =

T	O
3	2
1	1
2	1

83 – 46 =

7	8	13
	4	6
	3	7

Column subtraction (Y3 onwards)

932 – 457 becomes

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

Column subtraction with decimals (Y5/Y6)

```
    1  1  4
   2 2 . 5 10
-  1 9 . 2 8
-------------
   0 3 . 2 2
-------------
```

KEY STAGE 2
WRITTEN CALCULATION METHODS

Multiplication and Division Objectives

Year 3	Year 4 Objectives	Year 5 Objectives	Year 6 Objectives
• recall and use multipl/div facts for 3, 4 and 8 x 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.	• recall mult/div facts for all x 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 cal • multiply 2-digit/3-digit numbers by a 1-digit number using formal written layout • solve problems involving x +, including the distributive law multiply 2-digit x 1-digit, integer scaling problems and correspondence problems such as n objects are connected to m objects.	• identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers • Know, use the vocab of prime numbers, prime factors and composite (non- prime) no's • understand if a number up to 100 is prime and recall prime numbers up to 19 • x numbers up to 4 digits by a 1/2-digit number using a formal written method, including long multiplication for 2-digit nos • mult/divide numbers mentally drawing upon known facts • divide numbers up to 4 digits by a 1-digit number using the formal written method of short div and interpret remainders • x ÷ whole numbers and nos involving decimals by 10/100/ 1000	• x multi-digit numbers up to 4 digits by a 2-digit whole number using formal written long x • divide numbers up to 4 digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, in context • divide numbers up to 4 digits by a 2-digit number using the formal written method of short division where appropriate, interpreting remainders in context • mental calculations with mixed operations and large numbers • identify common factors, multiples and prime nos • use knowledge of the order of operations to carry out calculations involving 4 operations BODMAS

Multiplication Progression: builds upon secured KS1 written calculation methods

Multiplication (Y2/Y3)
Partitioning using the grid method

32 x 3 = 96

x	30	2
3	90	6

Short multiplication

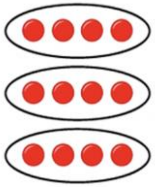
2 3 7
× 4
9 4 8

Long Multiplication

4 5 8
× 4 2
9 1 6
1 8 3 2 0
1 9 2 3 6

Division Progression: builds upon secured KS1 written calculation methods

Division as sharing (Y2/Y3)



12 ÷ 4 = 3

Bus stop division

98 ÷ 7 =

1 4
7 | 9 8

98 ÷ 7 =

0 8 6 r2
5 | 4 3 2

Division

4 2
19 | 7 9 8

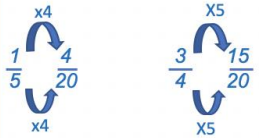
1x = 19
2x = 38
3x = 57
4x = 76
5x = 95
6x = 114
7x = 133
8x = 152
9x = 171
10x = 190

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.

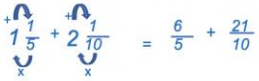


$\frac{4}{20} + \frac{15}{20} = \frac{19}{20}$

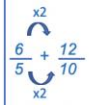
Answer: $\frac{19}{20}$

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

Strategy: convert both mixed numbers into improper fractions



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)

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

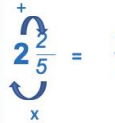
Next step: change ÷ to x

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

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

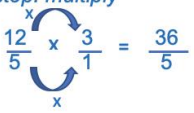
$2\frac{2}{5} \times 3 =$

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



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

Next step: multiply

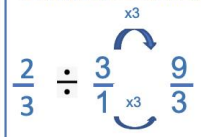


Answer: $7\frac{1}{5}$ ***given as a mixed number***

Dividing fraction by whole number

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

Convert each denominator into the LCM = 3



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

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.

$$\begin{array}{r} 1231 \\ 3\overline{)3693} \end{array}$$

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

$$\begin{array}{r} 1231 \\ \times \quad 2 \\ \hline 2462 \end{array}$$

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 90 x 5 = 450

Fractions of an amount

Fraction of an amount

¼ of 1000 =

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

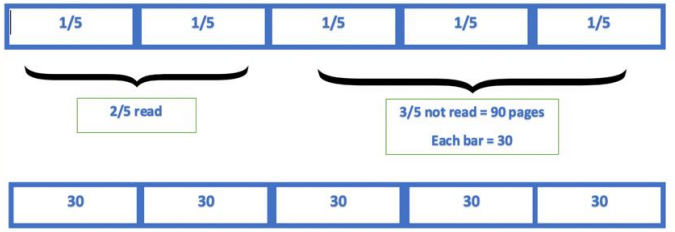
½ of 1000 = 500, ½ of 500 is 250.

Fluency links: ½ of 50 = 25, so ½ of 500 = 250

Fractions of an amount – Bar Model Method

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 bus stop division method.

```
  1 2 . 3
6 | 7 3 . 8
```

Answer: 12.3

Multiplying/Dividing decimals

70 ÷ ☐ = 3.5

Strategy: identify inverse method.

7 0 ÷ 3.5 = ☐

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

700 ÷ 35 =

```
   0 2 0
35 | 7 0 0
```

Answer: *20*

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*

KEY STAGE 2
WRITTEN CALCULATION METHODS: PERCENTAGES

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

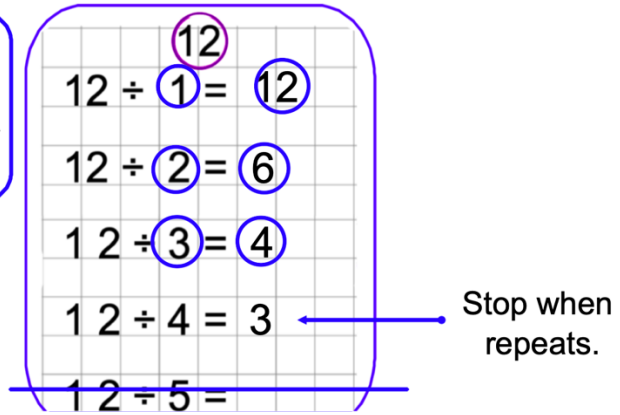
KEY STAGE 2
WRITTEN CALCULATION METHODS: MISCELLANEOUS

Factors

A **factor** is a number that divides into another number exactly and without leaving a remainder.

Factors:

1, 2, 3, 4, 6, 12



EAL scaffolding