

Welbeck Primary School



Mathematics KS2 Calculation Policy

Reviewed Summer 2023



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)

	2	5
+	1	3
	3	8

	8	4
+	3	2
1	1	6

	2	8
+	1	4
	4	2

/ carrying a 10

crossing 100



Column Addition (Y3 onwards)

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \end{array}$$



Column Addition with decimals (Y5/Y6)

$$124.9 + 117.25 = 242.15$$

$$\begin{array}{r} 124.90 \\ + 117.25 \\ \hline 242.15 \\ \hline \end{array}$$

Column subtraction (Y2/Y3)

$32 - 11 =$ $83 - 46 =$

	3	2
-	1	1
	2	1

	7	8	1	3
-		4	6	
		3	7	



onwards)

$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \end{array}$$



Cc

$$\begin{array}{r} 22.50 \\ - 19.28 \\ \hline 03.22 \end{array}$$

KEY STAGE 4
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

$$32 \times 3 = 96$$

Short multiplication

2 3 7

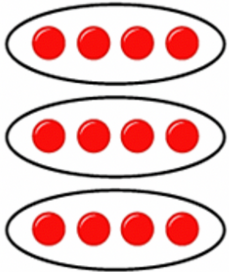
Long Multiplication

$$\begin{array}{r} 458 \\ \times 42 \\ \hline \end{array}$$

Division Progression

Division as sharing (Y2)

$$12 \div 4 =$$



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Bus stop division

$$98 \div 7 =$$

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

$$98 \div 7 =$$

$$\begin{array}{r} 086 \text{ r}2 \\ 5 \overline{) 432} \\ \underline{4} \\ 3 \\ \underline{3} \\ 2 \end{array}$$



GES

Division

$$\begin{array}{r} 42 \\ 19 \overline{) 7938} \\ \underline{77} \\ 23 \\ \underline{20} \\ 38 \\ \underline{38} \\ 0 \end{array}$$

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



25% of 88 = 22

Strategy: recognise that 25% is the same as $\frac{1}{4}$

To find a $\frac{1}{4} = \frac{1}{2}$ and $\frac{1}{2}$ again

$\frac{1}{2}$ of 88 = 44, $\frac{1}{2}$ 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% = $\frac{1}{2}$ of 10% = $\frac{1}{2}$ of 46 = **23**

Answer: 184 + 23 = 207

51% of 900 =

Strategy: recognise that 50% is the same as $\frac{1}{2}$

Use understanding of fluency that $\frac{1}{2}$ of 90 = 45, so $\frac{1}{2}$ of 900 = 450

$\frac{1}{2}$ 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 = 26.00 ÷ 10 = **2.6**

7%: 1% of £26.00 = 26.00 ÷ 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.

$$\frac{1}{5} \xrightarrow{\times 4} \frac{4}{20} \quad \frac{3}{4} \xrightarrow{\times 5} \frac{15}{20}$$

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

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

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

Strategy: convert both mixed numbers into improper fractions

$$1\frac{1}{5} + 2\frac{1}{10} = \frac{6}{5} + \frac{21}{10}$$

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

$$\frac{6}{5} + \frac{12}{10}$$

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 \div to \times

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

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

$$2\frac{2}{5} = \frac{12}{5} \quad 3 = \frac{3}{1}$$

Next step: multiply

$$\frac{12}{5} \times \frac{3}{1} = \frac{36}{5}$$

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

$\frac{2}{3}$ of 3693 =

Strategy: divide the whole number by the denominator ('bottom') to calculate $\frac{1}{3}$. 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 $\frac{2}{3}$

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

Answer: 2462

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

Strategy: divide the whole number by the denominator ('bottom') to calculate $\frac{1}{6}$. Use fluency: if $54 \div 6 = 9$, then

$$540 \div 6 = 90$$

Next step: then multiply this new number by the numerator ('top') to calculate $\frac{5}{6}$

$$90 \times 5 = 450$$

Fluency links: $9 \times 5 = 45$, so 90 x 5 = 450

Fraction of an amount


$\frac{1}{4}$ of 1000 =

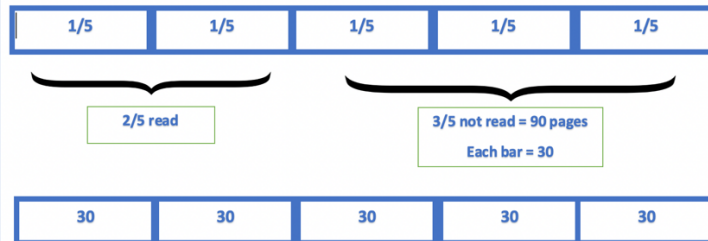
Strategy: recognise that to find a $\frac{1}{4}$ = $\frac{1}{2}$ and $\frac{1}{2}$ again

$\frac{1}{2}$ of 1000 = 500, $\frac{1}{2}$ of 500 is 250.

Fluency links: $\frac{1}{2}$ of 50 = 25, so $\frac{1}{2}$ of 500 = 250

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

$3.9 \times 30 =$

Strategy: use column multiplication.

$$\begin{array}{r} 30 \\ \times 3.9 \\ \hline 270 \\ + 900 \\ \hline 117.0 \end{array}$$

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

Multiplying/Dividing decimals

$15 \times 6.1 =$

Strategy: use column multiplication.

$$\begin{array}{r} 15 \\ \times 6.1 \\ \hline 15 \\ + 900 \\ \hline 91.5 \end{array}$$

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

Multiplying/Dividing decimals

$73.8 \div 6 =$

Strategy: use column multiplication.

$$\begin{array}{r} 30 \\ \times 3.9 \\ \hline 270 \\ + 900 \\ \hline 117.0 \end{array}$$

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

Answer: 117.0

Multiplying/Dividing decimals

$73.8 \div 6 =$

Strategy: use bus stop division method.

$$\begin{array}{r} 12.3 \\ 6 \overline{) 73.8} \end{array}$$

Answer: 12.3

Multiplying/Dividing decimals

$70 \div \square = 3.5$

Strategy: identify inverse method.

$70 \div 3.5 = \square$

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

$700 \div 35 =$

$$\begin{array}{r} 20 \\ 35 \overline{) 700} \end{array}$$

Answer: 20

KEY STAGE 2



WRITTEN CALCULATION METHODS: DECIMALS

Multiplying/Dividing by multiples of 10, 100, 1000

Multiples of 10/100/1000

$$0.9 \div 100 =$$

Strategy: underline and count the zeros (x2):

$$\underline{0.9} \div 100 =$$

Next step: Add in place holders to 0.9.

$$\underline{000.9} \div 100 =$$

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

$$000.\underline{09} \div 100 = 0.009$$

Answer: 0.009

Multiples of 10/100/1000

$$5.014 \times 10 =$$

Strategy: underline and count the zeros (x1):

$$\underline{5.014} \times 10 =$$

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

$$\underline{50.14} = 50.14$$

Answer: 50.14

Multiples of 10/100/1000

$$34.8 \times 1,000 =$$

Strategy: underline and count the zeros (x3):

$$\underline{34.8} \times 1000 =$$

Next step: Add in place holders

$$\underline{34800} =$$

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

$$34800.\underline{000} = 34800.0$$

Answer: 34800.0

Multiples of 10/100/1000

$$0.9 \times 200 =$$

Strategy: partition 200 into 100 and 100

$$0.9 \times 100$$

$$0.9 \times 100$$

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

$$0.9 \times 100 = 090.0$$

$$0.9 \times 100 = 90$$

Answer: 90 + 90 = 180

Multiples of 10/100/1000

$$343.1 \div 1000 =$$

Strategy: underline and count the zeros (x3):

$$343.1 \div 1000 =$$

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

$$\underline{343.1} \div 1000$$

$$= 0.343$$

Answer: 0.343

