Year 5 Maths Calculations Policies

National Curriculum Programme of Study:

- Add whole numbers with more than 4 digits, including using formal written methods (columnar addition).
- Pupils practise using the formal written methods of columnar addition with increasingly large numbers to aid fluency (non-statutory).
- Solve problems involving numbers up to three decimal places.
- Practise adding decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, 0.83 + 0.17 = 1) (non-statutory).

Y5
Addition

BY THE END OF YEAR 5…

By the end of Year 5, children will be able to show their understanding as:

	1	2	8	3	6
+		7	2	8	8
	2	0	1	2	4
	1	1	1	1	

	2	1	.	3	0
+		9	.	0	8
	3	0	.	3	8
	1				

Following on from Year 4…
Formal column addition, including addition of mixed decimal numbers in a range of contexts

Children should continue to use the place value counters, in columns, to support their conceptual understanding of addition and the place value of larger and smaller numbers (to 3 decimal places).

Teachers should ensure they include examples in context as well as those requiring the addition of several numbers and different numbers of decimal places.

£10.38 + £2.85

	1	0	.	3	8
+		2	.	8	5
	1	3	.	2	3
		1		1	

1.25m + 12 ½ m + 37.5cm

	1	2	.	5	0	0	
+		1	.	2	5	0	
		0	.	3	7	5	
	1	4	.	1	2	5	m
		1		1			

It is good practice to use place holder '0', giving the same number of decimal places to each item. This assists in the ordering of decimals later, and ensures columns are in-line.

National Curriculum Programme of Study:

- subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction)
- pupils use all four operations in problems involving money

Y5
Subtraction

BY THE END OF YEAR 5...

By the end of Year 5, children will be able to show their understanding as:

		5	1	2	1
	4	~~6~~	1	~~3~~	2
-	2	3	5	2	8
	2	2	6	0	4

		4	11	1		2	1	
	1	~~5~~	~~2~~	1	.	~~3~~	0	4
-		3	7	9	.	0	8	3
	1	1	4	2	.	2	2	1

Following on from Year 4...
Formal column subtraction, including subtraction of mixed decimal numbers in a range of contexts

Children should continue to use the place value counters, in columns, to support their conceptual understanding of subtraction and the place value of larger and smaller numbers (to 3 decimal places).

Teachers should ensure they include examples in context as well as those requiring the subtraction of several numbers and different numbers of decimal places.

£42.38 - £14.85

	3	11		1	
	~~4~~	~~2~~	.	3	8
-	1	4	.	8	5
	2	7	.	5	3

A farmer erects four vertical fence posts at 24.3m, 7.07m, 15.86m and 4.82m from his house. What is the distance between each of the posts where the farmer will need to place his fencing?

E.g. 24.3m – 15.86m = 8.44m between the two posts that are furthest from the house

	1	13		12	1	
	~~2~~	~~4~~	.	~~3~~	0	
-	1	5	.	8	6	
	0	8	.	4	4	m

National Curriculum Programme of Study:

- 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

Y5
Multiplication

BY THE END OF YEAR 5…

By the end of Year 5, children will be able to show their understanding as:

		2	7	4	1
x					6
	1	6	4	4	6
		4	2		

			4	2	7	6
x					3	4
		1	7	1	0	4
			1	3	2	
	1	2	8	2	8	0
			2	1		
	1	4	5	3	8	4
		1				

Following on from Year 4…
Formal column method for short multiplication (HTO x O)

	1	4	3
x			6
	8	5	8
	2	1	

The compact column method for multiplication of HTO x O is introduced towards the end of Year 4.

Consolidation of short multiplication should continue with increasingly large numbers, using the same method as that taught previously.

		2	7	4	1
x					6
	1	6	4	4	6
		4	2		

Short multiplication involving decimal numbers

Decimal multiplication should be introduced in context, e.g. requiring children to calculate the cost of 6 items, priced at £3.25 each.

The expanded method should be used for recording, ensuring that the accompanying explanation details the value of the digits in terms of their monetary value:
'6 lots of 5 pence are 30 pence… 6 lots of 20 pence is £1.20… 6 lots of £3 is £18.00… 30 pence add 20 pence is 50 pence, £18 add £1 is £19… giving a total of £19.50

		3	.	2	5
x					6
			.	3	0
		1	.	2	0
	1	8	.	0	0
	1	9	.	5	0

		3	.	2	5
x					6
	1	9	.	5	0
	1	1		3	

Once the children are considered to have the required conceptual understanding, and they are confident in using the language required to maintain the value of the digits involved, they can be introduced to the compact method for multiplication involving decimals.

As with all other stages, the children should be shown the two calculations alongside each other, enabling the children to see the similarities between the two different written layouts.

Moving towards mental methods

Children need to multiply whole numbers and those involving decimals, by 10, 100, 1000. Use a place value grid, where necessary, to remind children of the value of each column (Th, H, T ,O). Check understanding of the relationship between the columns (each is ten times bigger than the column to its right).

Using a place value grid, demonstrate how by moving each digit one place to the left, the value of the number increases (x 10). Use zero as a place holder in the empty column.

Repeat to show the impact of multiplying by one hundred and then one thousand. *How many places has each digit moved? In which direction do digits move to make a number bigger? Do we need to use a place holder/s?*

Explore the inverse relationship between multiplication and division. *What would happen to a number if we moved its digits one place to the right? What operation is this? (dividing by 10).*

Explode the misconception that to multiply by ten we just 'add a zero'. *What is 8.4 multiplied by ten?*

Column method for long multiplication

		1	6
x		1	3
		1	8
		3	0
	1	6	0
	2	0	8
	1		

Show the layout for expanded column multiplication involving two 2-digit numbers.
The children should be encouraged to discuss the different parts of the calculation, e.g. *How did we get the answer 18? Which two digits were multiplied together to produce 30? Where does 208 come from?*

As soon as children have the necessary conceptual understanding, move to the compact column method for long multiplication. Initially, modelling needs to be alongside the expanded form and accompanied with clear explanation and precise use of mathematical vocabulary.
Children need to be reminded of Punk '0', why it is used and what it represents.

	1	6
x	1	3
	4	8
	1	
1	6	0
2	0	8
1		

Extending to the multiplication of larger numbers

	1	4	2
x		3	1
	1	4	2
4	2	6	0
1			

Extend to long multiplication for 3-digit by a 2-digit number, and then 4-digit by a 2-digit number, maintaining the importance of verbalising the value of the digits involved.

		4	2	7	6
x				3	4
	1	7	1	0	4
		1	3	2	
1	2	8	2	8	0
		2	1		
1	4	5	3	8	4
	1				

National Curriculum Programme of Study:

- 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

Y5
Division

BY THE END OF YEAR 5…

By the end of Year 5, children will be able to show their understanding as:

Divide 4 digit number by 1 digit with appropriate remainder (fraction)

$$\begin{array}{r|llll} & 0 & 8 & 6 & 4\ \ {}^{1}/_{5} \\ \hline 5 & 4 & {}^{4}3 & {}^{3}2 & {}^{2}1 \end{array}$$

Consolidate understanding of short division with remainders

Following on from Year 4, children should be given the opportunity to consolidate their understanding of the formal short division method for division, expressing remainders as whole numbers. Use place value counters where appropriate. Ensure examples are given in context, where children are required to decide whether the remainder should be left, or the answer rounded up or down.

$$\begin{array}{r|llll} & 0 & 8 & 6 & 4\ \ \text{r.1} \\ \hline 5 & 4 & {}^{4}3 & {}^{3}2 & {}^{2}1 \end{array}$$

Expressing remainders as fractions

Present the children with a simple division calculation, such as 13 ÷ 3. Ask them to estimate the answer. *Which two whole numbers will the answer fall between? How do you know?*

Draw in the boundary line and share the single place value counters between the three rows. Discuss the answer as 4 remainder 1. Now provide a context for the question, e.g. 13 cakes are shared equally among three children. How much cake will they each receive? *Is the answer '4 remainder 1' still appropriate? What would the children do with the last remaining cake?*

Explain that the remaining cake would be cut and shared equally among the three children, giving them an additional ${}^{1}/_{3}$ of a cake each. So the answer would be 4 and ${}^{1}/_{3}$. Relate this to potentially splitting the final place value counter into three equal parts and sharing between the three rows.
Alternatively, focusing on the groups (columns) of three counters, the remaining counter is one out of the next group of three, resulting in 4 and ${}^{1}/_{3}$ groups of 3 in 13.

Expressing remainders as decimals

For those division calculations where the fraction remainders are familiar to the children, they can be expressed as a decimal. Initially this should be introduced in context; through money or measures.

E.g. £1389 ÷ 4

1389 ÷ 4 = 347 remainder 1

```
   0 3 4 7  r.1
  ___________
4 | 1 3¹8¹9²
```

$1389 \div 4 = 347\ ^1/_4$

The remainder of 1 needs to be shared between 4, resulting in an extra $^1/_4$ each.
Alternatively the remainder of 1 is 1 out of the next group of 4, so only $^1/_4$ of the next group can be made.

```
   0 3 4 7  1/4
  ___________
4 | 1 3¹8¹9²
```

£1389 ÷ 4 = £347.25

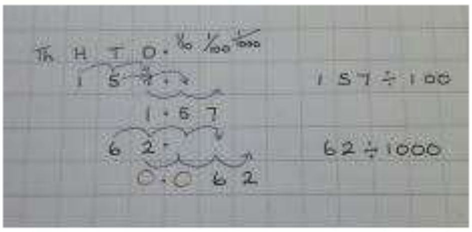
Familiar fractions such as $^1/_1$ can be converted to decimal remainders to fit the money context.

```
   0 3 4 7 . 2 5
  _______________
4 | 1 3¹8¹9²
```

Moving towards mental methods

Children need to divide whole numbers and those involving decimals, by 10, 100, 1000. Use a place value grid, where necessary, to remind children of the value of each column (Th, H, T ,O). Check understanding of the relationship between the columns (each is ten times bigger than the column to its right).

Using a place value grid, demonstrate how by moving each digit one place to the right, the value of the number decreases (÷10).



Repeat to show the impact of dividing by one hundred and then one thousand. *How many places has each digit moved? In which direction do digits move to make a number smaller? Do we need to use a place holder/s?* Explore the inverse relationship between multiplication and division. What would happen to a number if we moved its digits one place to the left? What operation is this? (multiplying by 10).