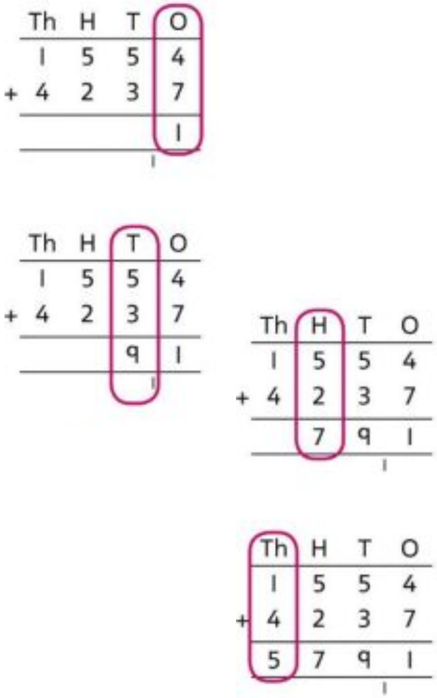
Year 4

Calculation Methods: Year 4



Addition

Children learn to add numbers with 4 digits using **column addition**.

When we need to **exchange** (for example 10 ones becomes 1 ten in the first calculation), we record this underneath the calculation.

In column addition and subtraction, we always start calculating with the **ones column** first.

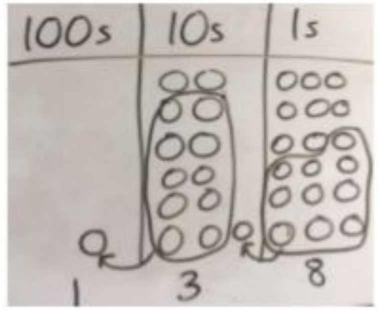
The calculation here shows how we add one column at a time and record exchanges.

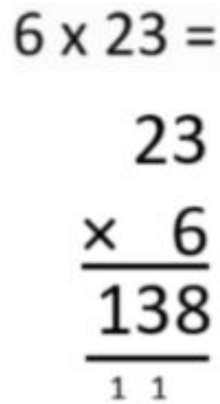
Multiplication

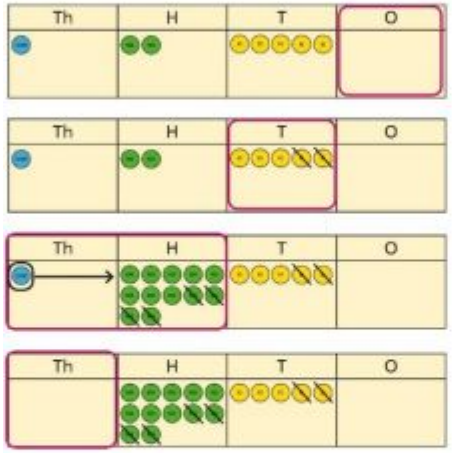
We progress to multiplying 2-digit and 3-digit numbers by 1-digit. We use **column multiplication**.

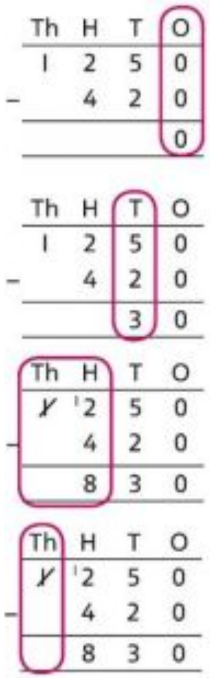
We record **exchanges** underneath the calculation in the same way that we do when using column addition and subtraction.

The picture on the right demonstrates how we might demonstrate the multiplication with its exchanges using a diagram.









Subtraction

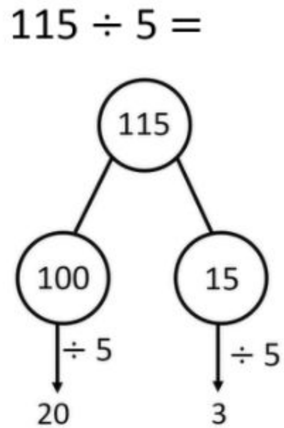
Children learn to subtract numbers with 4 digits using **column subtraction**.

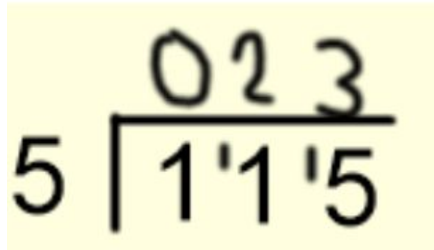
We use diagrams, and occasionally place value counters, such as this one, to show children when we need to make **exchanges** in our subtraction calculations.

Division

We use the **'bus shelter' short division scaffold** to divide multi-digit numbers by a single-digit. We start by looking at the largest digit.

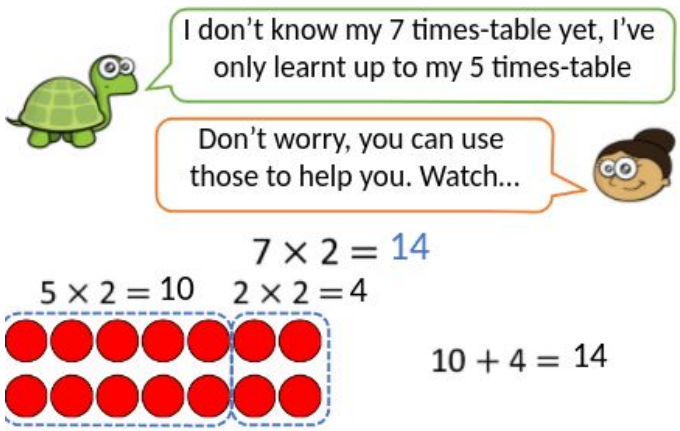
We use place value diagrams and counters to help children to understand how we are **grouping** to help us with the division.





Learning our Multiplication and Division Facts

In Year 4, we aim to learn all our multiplication and division facts up to the 12 times tables. To help us with this, we learn about the relationships between different multiplication tables.



Finding Fractions of Quantities

$$\frac{3}{5}$$ ← numerator ← denominator

In Year 4, we continue to find fractions of quantities. We always divide our whole number by the **denominator** first. That tells us how large one 'piece' is.

For example, if we were finding **¾ of 32,** we would start by calculating:

32 ÷ 4 = 8 = ¼

Then we would multiply that value by the **numerator** of the fraction.

8 x 3 = 24 = ¾

Useful Concepts in Calculation: Year 4

It's also important children remember that multiplication is **commutative**. That means that the calculation gives the same answer no matter in which order the numbers are multiplied. See the example below for a visual representation of this.

3 x 4 = 4 x 3 = 12

As a further example, this means that if children know that:

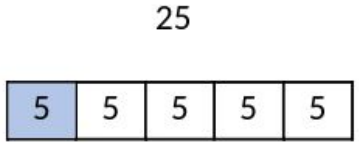
7 x 2 = 14 they also know: **2 x 7 = 14**

Children also learn to derive the associated division facts from their tables, so they also deduce:

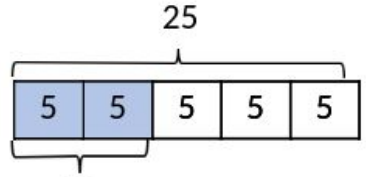
14 ÷ 2 = 7 and **14 ÷ 7 = 2**

The example and diagrams below demonstrate how we would use our knowledge of ⅕ of a number to find fraction amounts of a quantity.

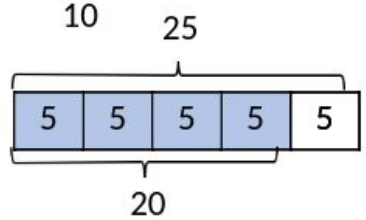
$\frac{1}{5}$ of 25 = 5



$\frac{2}{5}$ of 25 = 10



$\frac{4}{5}$ of 25 = 20



Year 5

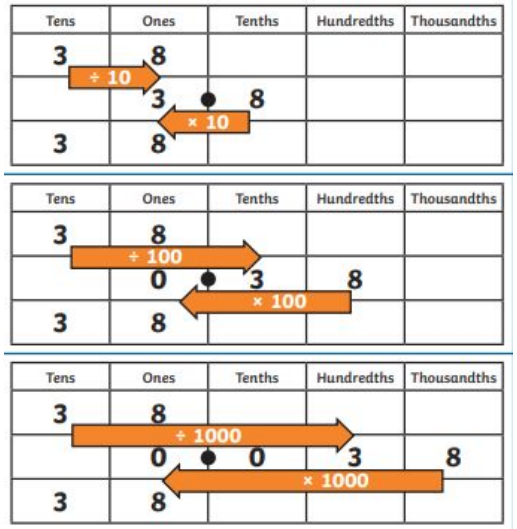
Useful Concepts in Calculation: Year 5

Multiplying and dividing by 10, 100 and 1000

We use place value grids like the one at the bottom of the page to show children what happens when we multiply and divide by 10, 100 and 1000. We don't talk about 'adding a zero' as this can cause errors when working with decimal numbers.

We can use our knowledge of multiplying and dividing by 10, 100 and 1000 alongside our tables knowledge to complete calculations like the ones in this grid.

8 × 9 = 72 80 × 9 = 720	9 × 8 = 72 90 × 8 = 720
72 ÷ 9 = 8 720 ÷ 9 = 80	72 ÷ 8 = 9 720 ÷ 8 = 90



When multiplying by 10, the digits move one place to the left.
When dividing by 10, the digits move one place to the right.

When multiplying by 100, the digits move two places to the left.
When dividing by 100, the digits move two places to the right.

When multiplying by 1000, the digits move three places to the left.
When dividing by 1000, the digits move three places to the right.

Adding and Subtracting with Fractions

$\frac{3}{5}$ ← numerator
denominator

When adding and subtracting fractions, we learn to convert the fractions so they have the same denominator.

For example, we know that $\frac{1}{4}$ is the same as $\frac{2}{8}$

This means in the calculation below we can turn $\frac{1}{4}+\frac{3}{8}$ into $\frac{2}{8}+\frac{3}{8}$

When adding two fractions with the same denominator, we just need to add the numerators and leave the denominators the same. It works the same way with subtraction.

What is $\frac{1}{4}+\frac{3}{8}$?

Use the bars to help you.

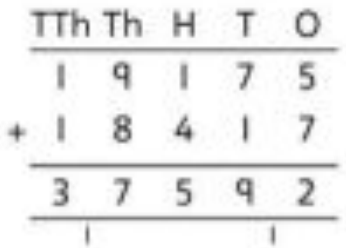
$\frac{5}{8}$

Explain your method.

E.g. I split the quarters in 2 to make eighths then I could easily add the two fractions.

Calculation Methods: Year 5

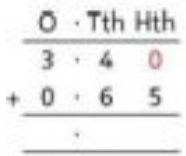
Addition



Children learn to add numbers with more than 4 digits using **column addition**, including numbers with tenths and hundredths.

When we need to **exchange** (for example 10 ones becomes 1 ten in the first calculation), we record this underneath the calculation.

$3.4 + 0.65 = ?$



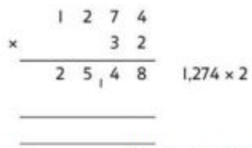
Children are also taught to include a zero as a **placeholder** when adding two numbers with a different amount of decimal places.

Multiplication

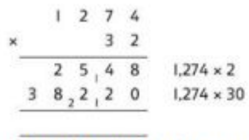
We progress to multiplying 3-digit and 4-digit numbers by 2-digits. We use **column multiplication**.

Children need to add a zero as a **placeholder** to the ones column when multiplying by tens. In this calculation, it reminds them they are multiplying by 30 and not multiplying by 3.

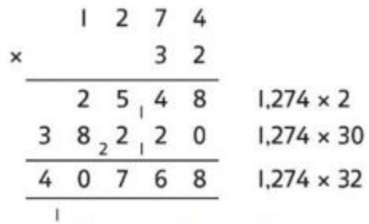
1,274 × 32 = ?
First multiply 1,274 by 2.



Then multiply 1,274 by 30.

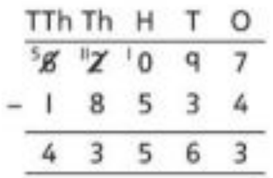


Finally, find the total.



1,274 × 32 = 40,768

Subtraction

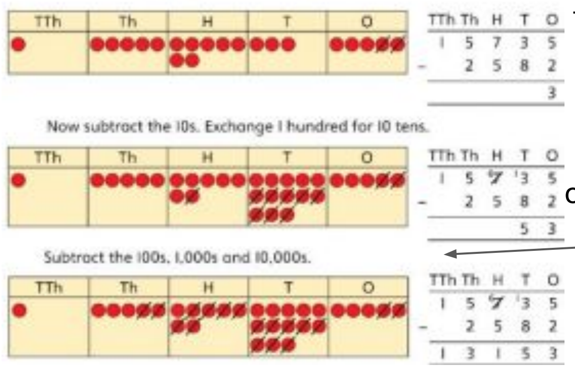


62,097 − 18,534 = 43,563

Children learn to subtract numbers with more than 4 digits using **column subtraction**, including numbers with tenths and hundredths.

When completing column subtraction, children always start in the column furthest to the right (the column with the smallest value).

15,735 − 2,582 = 13,153

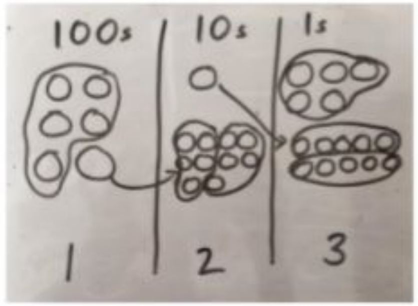


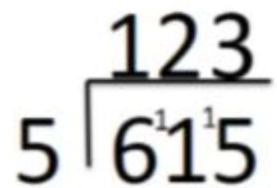
We use diagrams, and occasionally place value counters, such as this one, to show children when we need to make **exchanges** in our subtraction calculations.

Division

We use the **'bus shelter' short division scaffold** to divide multi-digit numbers by a single-digit. We start by looking at the largest digit.

We use place value diagrams and counters to help children to understand how we are **grouping** to help us with the division.





Year 6

Calculation Methods: Year 6

Addition

TTh	Th	H	T	O
	1	9	1	7	5
+	1	8	4	1	7
	3	7	5	9	2
		1			1

Children learn to add numbers with more than 4 digits using **column addition**, including numbers with tenths and hundredths.

When we need to **exchange** (for example 10 ones becomes 1 ten in the first calculation), we record this underneath the calculation.

3.4 + 0.65 = ?

	O	·	Tth	Hth
	3	·	4	0
+	0	·	6	5
		·		

Children are also taught to include a zero as a **placeholder** when adding two numbers with a different amount of decimal places.

Multiplication

We progress to multiplying 3-digit and 4-digit numbers by 2-digits. We use **column multiplication**.

Children need to add a zero as a **placeholder** to the ones column when multiplying by tens. In this calculation, it reminds them they are multiplying by 30 and not multiplying by 3.

1,274 × 32 = ?
First multiply 1,274 by 2.

	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2

Then multiply 1,274 by 30.

	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2
3	8	2 2	1 2	0	1,274 × 30

Finally, find the total.

	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2
3	8	2 2	1 2	0	1,274 × 30
4	0	7	6	8	1,274 × 32
	1				

1,274 × 32 = 40,768

Subtraction

TTh	Th	H	T	O
5	11	1 0	9	7
−	1	8	5	3	4
	4	3	5	6	3

62,097 − 18,534 = 43,563

Children learn to subtract numbers with more than 4 digits using **column subtraction**, including numbers with tenths and hundredths.

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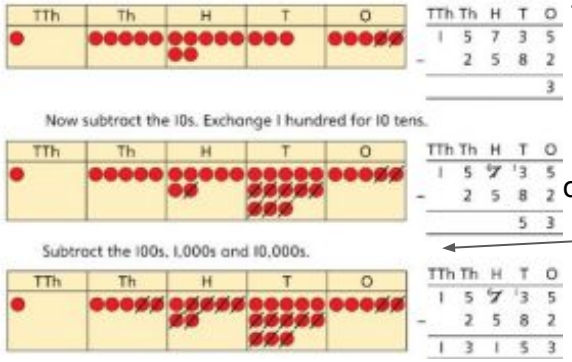
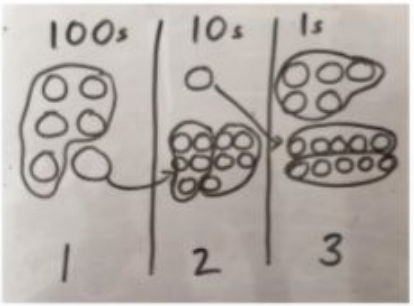


We use diagrams, and occasionally place value counters, such as this one, to show children when we need to make **exchanges** in our subtraction calculations.

Division

We use the **'bus shelter' short division scaffold** to divide multi-digit numbers by a single-digit. We start by looking at the largest digit.

We use place value diagrams and counters to help children to understand how we are **grouping** to help us with the division.



$$5\overline{)615} = 123$$

Useful Concepts in Calculation: Year 6

Long Division

When we divide multi-digit numbers by two-digit numbers, the short division scaffold is not always useful. When this occurs, we can use one of two methods. The first is called **chunking**. We find useful multiplication facts to help us and then use these to subtract 'chunks' of the **divisor.** See the example below.

$598 \div 13 = 46$

$13 \times 1 = 13$ $13 \times 10 = 130$
$13 \times 2 = 26$ $13 \times 20 = 260$
$13 \times 3 = 39$ $13 \times 30 = 390$
$13 \times 4 = 52$ $13 \times 40 = 520$
$13 \times 5 = 65$ $13 \times 50 = 650$
$13 \times 6 = 78$ $13 \times 60 = 780$
$13 \times 7 = 91$ $13 \times 70 = 910$

		4	6	
13	5	9	8	
–	5	2	0	(×40)
		7	8	
–		7	8	(×6)
			0	

Our second method is called **drop down long division**. This method is more efficient and often requires fewer subtractions. See below for an example:

$359 \div 16 = 22$ r7

16 32 48 64 80 96 112 128 144 160

As we do with chunking, we have written down some key multiplication facts at the start of the calculation to help us.

		2	2
16	3	5	9
–	3	2	
		3	9
–		3	2
			7

BODMAS/ BIDMAS

The acronym BODMAS or BIDMAS refers to the order we complete operations in a given calculation.

B	Brackets	$10 \times (4 + 2) = 10 \times 6 = 60$
O	Order	$5 + 2^2 = 5 + 4 = 9$
D	Division	$10 + 6 \div 2 = 10 + 3 = 13$
M	Multiplication	$10 - 4 \times 2 = 10 - 8 = 2$
A	Addition	$10 \times 4 + 7 = 40 + 7 = 47$
S	Subtraction	$10 \div 2 - 3 = 5 - 3 = 2$

We sometimes use the word 'indices' to refer to this part.

We can't simply complete a multi-operation calculation from left to right, we have to complete the parts in the order of BODMAS/BIDMAS to ensure we get the correct answer.

For example in the calculation:
10 + 6 x 2 =
We must complete the multiplication first to give us:
10 + 6 x 2 =
10 + 12 = 22

If the calculation was
(10 + 6) x 2 =
We would complete the part in the brackets first, even though it is an addition.
(10 + 6) x 2 =
16 x 2 = 32

Calculating with Fractions: Year 6

Adding and Subtracting with Fractions

$\frac{3}{5}$ ← numerator ← denominator

When adding and subtracting fractions, we learn to convert the fractions so they have the same denominator.

For example, we know that $\frac{1}{4}$ is the same as $\frac{2}{8}$

This means in the calculation below we can turn $\frac{1}{4}+\frac{3}{8}$ into $\frac{2}{8}+\frac{3}{8}$

When adding two fractions with the same denominator, we just need to add the numerators and leave the denominators the same. It works the same way with subtraction.

What is $\frac{1}{4}+\frac{3}{8}$?

Use the bars to help you.

$\frac{5}{8}$

Explain your method.

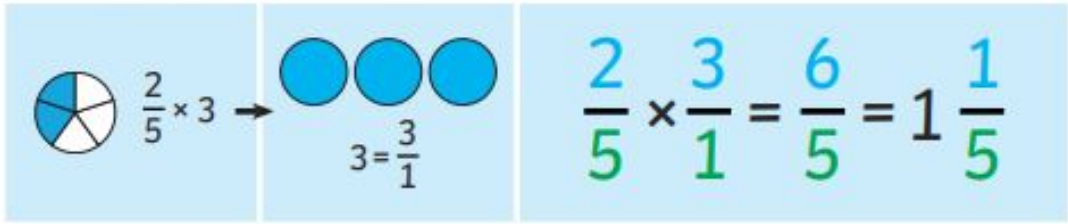
E.g. I split the quarters in 2 to make eighths then I could easily add the two fractions.

Multiplying Fractions

Multiplying Fractions by Fractions

$$\frac{1}{2}\times\frac{1}{3}=\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$$

Multiplying Fractions by Whole Numbers



Dividing Fractions by Whole Numbers

When dividing a fraction by a whole number we use two methods.
If the numerator is divisible by the whole number, we can just divide the numerator and leave the denominator the same eg:

$$\frac{2}{5}\div 2=\frac{1}{5}$$

If the numerator cannot be divided by the whole number, we use our knowledge of fractions eg:

Multiplication and division are the inverse of one another so:

÷ 2 is the same as × $\frac{1}{2}$

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