Our Lady of the Rosary Catholic Primary School

Calculation Policy

2021-2

INTRODUCTION

This calculation policy has been written in line with the programmes of study taken from the National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression. The content is set out in yearly blocks under the following headings: addition, subtraction, multiplication and division. Statements taken directly from the programmes of study are listed in bold at the beginning of each section.

Children will use mental methods as their first port of call when appropriate, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence.

AIMS OF THE POLICY

- To ensure consistency and progression in our approach to calculation
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations
- To ensure that children can use these methods accurately with confidence and understanding

HOW TO USE THIS POLICY

- Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning
- Always use Assessment for Learning to identify suitable next steps in calculation for groups of children
- If, at any time, children are making significant errors, return to the previous stage in calculation
- Use key vocabulary and mental methods
- Use concrete resources, models and images to support children's understanding of calculation and place value, as appropriate
- Encourage children to make sensible choices about the methods they use when solving problems

Stages in Addition

Addition - Early Stages (EYFS)

Children will engage in a wide variety of songs and rhymes, games and activities. They will begin to relate addition to combining two groups of objects, first by counting all and then by counting on from the largest number.

They will find one more than a given number.

In practical activities and through discussion they will begin to use the vocabulary involved in addition.

'You have five apples and I have three apples. How many apples altogether?'

Addition - Year One

- **Given a number, identify one more**
- **Read, write and interpret mathematical statements involving addition (+) and the equals (=) sign**
- **Add one- digit and two-digit numbers within 20, including zero**
- **Solve missing number problems eg 10 + = 16**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Children will continue to practise counting on from any number e.g.' Put five in your head and count on four.'

Initially use a number track to count on for addition, counting on from the largest number:

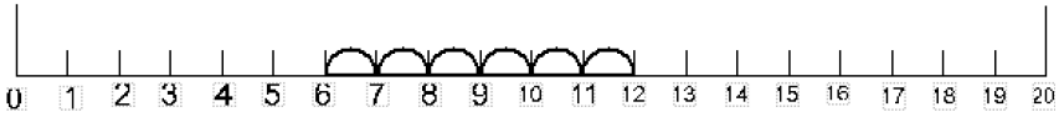
1	2	3	4	5	6	7	8	9	10

5 + 4 = 9

'Put your finger on number five. Count on (count forwards) four.'

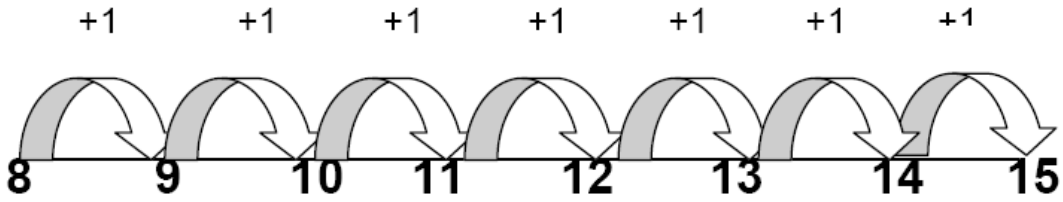
Then progress to a marked number line:

6 + 6 = 12



'Put your finger on number six and count on six.'

8 + 7 = 15 **'Put your finger on number eight and count on seven.'**



Ensure children are confident with using a marked number line before moving on to an empty number line (see year two guidance).

Continue to practise counting on from the largest number for addition with totals within 20.

Use in conjunction with a 100 square to show jumps of tens.

48 + 36 = 84

‘Put the biggest number first (48), and then partition the smaller number (36 = 30 + 6) and count on: 48 + 30 + 6.’

Addition - Year Two

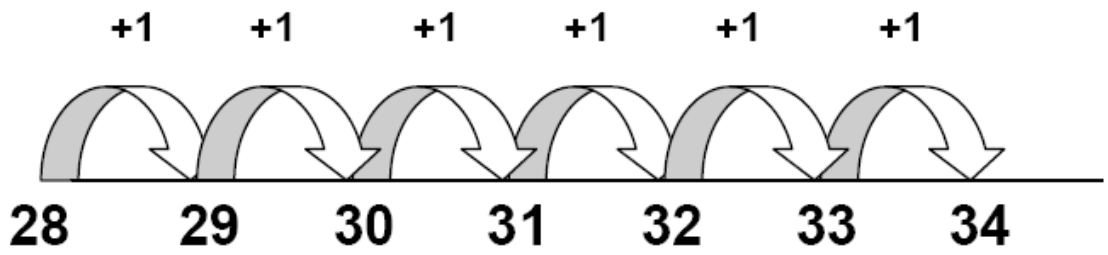
- **Add numbers using concrete objects, pictorial representations, and mentally, including:**

  - **A two digit number and ones**
  - **A two digit number and tens**
  - **Two two-digit numbers**
  - **Three one-digit numbers**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

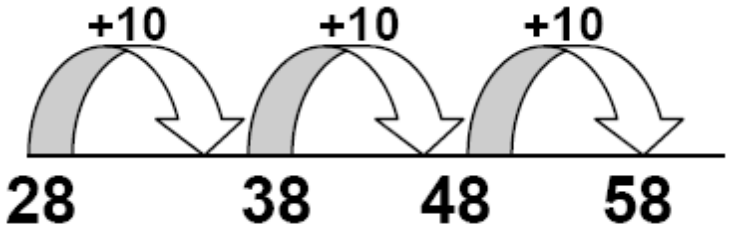
Counting on in ones using an empty number line, within 100…

28 + 6 = 34



…and in tens

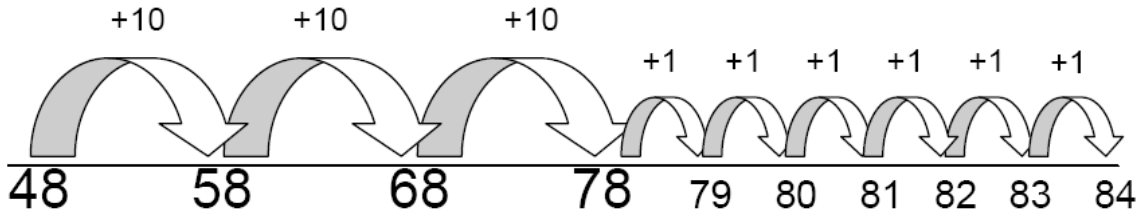
28 + 30 = 58



Use in conjunction with a 100 square to show jumps of tens.

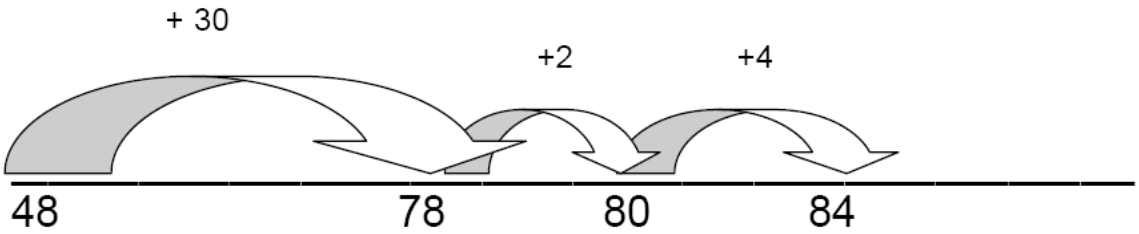
48 + 36 = 84

‘Put the biggest number first (48), and then partition the smaller number (36 = 30 + 6) and count on: 48 + 30 + 6.’



Use in conjunction with a 100 square to show jumps of tens and ones.

If children are confident, use more efficient jumps…



Use in conjunction with a 100 square to show jumps of tens and ones/units.

Also use the **partitioning** method to add two two-digit numbers:

43 + 25 = 68

40 3 20 5

40 + 20 = 60
3 + 5 = 8
60 + 8 = 68

‘Partition the numbers into tens and ones/units. Add the tens together and then add the ones/units together. Recombine to give the answer’.

Then move on to calculations that bridge the tens:

$$48 + 36 = 40 + 8 + 30 + 6$$
$$40 + 30 = 70$$
$$8 + 6 = 14$$
$$70 + 14 = 84$$

$$48 + 36 = 84$$

This is an alternative way of recording the **partitioning method**.

Further develop addition with numbers that bridge 100, using a 200 grid to support.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

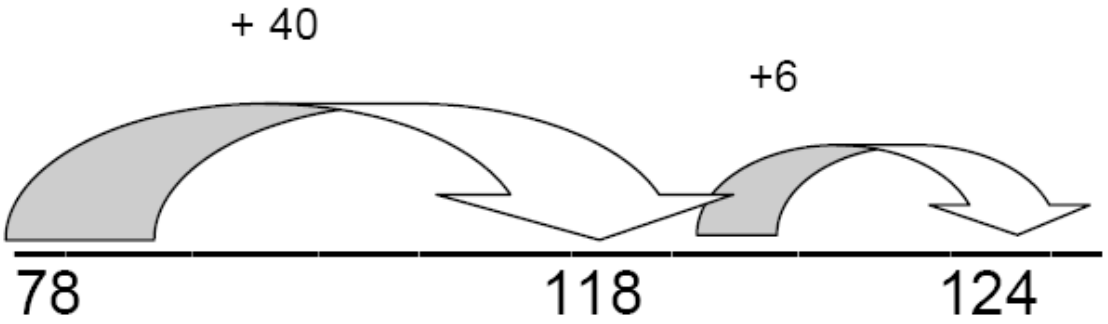
Addition - Year Three

- **Add numbers with up to three digits, using formal written method of columnar addition**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

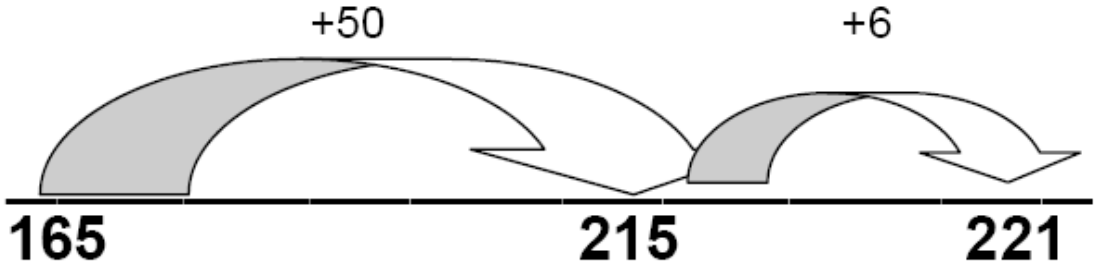
Further develop the use of the empty number line with calculations that bridge 100:

78 + 46 = 124



Use a 200 grid to support counting on in tens and bridging 100…
… and with addition of a three-digit and a two -digit number:

165 + 56 = 221



Further develop the **partitioning method** with calculations that bridge 100:

85 + 37 = 80 + 5 + 30 + 7

80 + 30 = 110
5 + 7 = 12
110 + 12 = 122

85 + 37 = 122

The **partitioning method** can also be used with three-digit numbers.

Introduce the **expanded written method** with the calculation presented both horizontally and vertically (in columns).

Initially use calculations where it has not been necessary to bridge across the tens or hundreds:

63 + 32 = 95

60 + 3
\+ 30 + 2
90 + 5 = 95

Add the least significant digits (units) together first and then the tens in preparation for the formal written method.

Then…

6 3
+3 2
5 (3 + 2)
9 0 (60 + 30)
9 5

Use the language of place value to ensure understanding:

'Three add two equals five. Write five in the units column.60 add 30 equals 90. Write 9 (90) in the tens column.'

This will lead into the **formal written method**…

6 3
\+ 3 2
9 5

NB Informal/mental methods would be more appropriate for numbers of this size, but use two-digit numbers when introducing the columnar method.

Then introduce calculations where it is necessary to bridge, returning to an **expanded method** initially:

68 + 24 = 92

60 + 8
\+ 20 + 4
80 +12 = 92

'Partition the numbers into tens and ones/units. Add the tens together and then add the ones/units together. Recombine to give the answer.'

Then…

```
  6 8
+2 4
  1 2  (8 + 4)
  8 0  (60 + 20)
  9 2
```

Add the least significant digits (units) together first and then the tens in preparation for the formal written method.

If children are ready, introduce the formal written method, where it is necessary to 'carry' ten from the units to the tens column:

```
  6 8
+2 4
  9 2
  1
```

Use the language of place value to ensure understanding:

'Eight add four equals 12. Write two in the units column and 'carry' one (10) across into the tens column. 60 add 20 and the ten that we 'carried' equals 90. Write 9 (90) in the tens column. 92 is the answer.

The digit that has been 'carried' should be recorded under the line in the correct column.

When children are confident, extend with examples where it is necessary to bridge across the tens and the hundreds:

76 + 47 = 123

```
  70 + 6
+ 40 + 7
 110 +13 = 123
```

'Partition the numbers into tens and ones/units. Add the tens together and then add the ones/units together. Recombine to give the answer.'

Then...

```
  7 6
  4 7
  1 3 (7 + 6)
1 1 0 (70 + 40)
1 2 3
```

Add the least significant digits (units) together first and then the tens in preparation for the formal written method.

If children are ready introduce the formal written method, where it is necessary to 'carry' across the columns and bridge 100:

76 + 47 = 123

$$\begin{array}{r} 4\ 7 \\ +7\ 6 \\ \hline 1\ 2\ 3 \\ 1\ 1 \end{array}$$

Use the language of place value to ensure understanding:

'Seven add six equals 13. Write three in the units column and 'carry' one (10) across into the tens column. 40 add 70 and the ten that we 'carried' equals 120. Write 2 (20) in the tens column and 'carry' one (100) across into the hundreds column (100).'

The digits that have been 'carried' should be recorded under the line in the correct column.

If children are confident, further develop with the addition of a three- digit number and a two -digit number:

178 + 43 = 221

$$\begin{array}{r} 1\ 7\ 8 \\ +\ \ 4\ 3 \\ \hline 2\ 2\ 1 \\ 1\ 1 \end{array}$$

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Addition - Year Four

- **Add numbers with up to 4 digits using the formal written method of columnar addition where appropriate**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to teach the use of **empty number lines** with three and four digit numbers, as appropriate.

Further develop the formal written method of addition, with three-digit numbers. Revisit the expanded method first, if necessary:

176 + 147 = 323

```
  1 7 6
+1 4 7
    1 3 (7 + 6)
  1 1 0 (70 + 40)
+2 0 0 (100 + 100)
  3 2 3
```

This will lead into the formal **written method**…

176 + 147 = 323

```
  1 4 7
+1 7 6
  3 2 3
  1   1
```

Use the language of place value to ensure understanding:

'Seven add six equals 13. Write three in the units column and 'carry' one across into the tens column (10). 40 add 70 and the ten that we carried equals 120. Write 2 in the tens column (20) and 'carry' 1 across into the hundreds column (100). 100 add 100 and the 100 that has been carried equals 300. Write 3 in the hundreds column (300).'

The digits that have been **'carried'** should be recorded under the line in the correct column.

If children are confident, introduce the addition of a four-digit number and a three digit number:

1845 + 526 = 2371

$$\begin{array}{r} 1\,8\,4\,5 \\ +\ \ 5\,2\,6 \\ \hline 2\,3\,7\,1 \\ \scriptstyle 1\quad\ 1 \end{array}$$

Continue to develop with addition of two four-digit numbers and with decimals (in the context of money or measures).

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

- **Add fractions with the same denominator.**

$$\frac{4}{8} + \frac{1}{8} = \frac{4+1}{8} = \frac{5}{8}$$

Addition - Year Five

- **Add whole numbers with more than 4 digits, including using formal written method (columnar addition)**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to teach the use of **empty number lines** with larger numbers (and decimals), as appropriate.

Continue to develop the **formal written method** for addition with larger numbers (and decimal numbers) and with the addition of three or more numbers:

21848 + 1523 = 23371

$$\begin{array}{r} 21848 \\ +\ 1523 \\ \hline 23371 \\ {\scriptstyle 1\ \ 1} \end{array}$$

Continue to use the language of place value to ensure understanding. Ensure that the digits that have been 'carried' are recorded under the line in the correct column.

Use the **formal written method** for the addition of decimal numbers:

£154.75 + £233.82 = £388.57

$$\begin{array}{r} 154{\cdot}75 \\ +\ 233{\cdot}82 \\ \hline 388{\cdot}57 \\ {\scriptstyle 1} \end{array}$$

Continue to use the language of place value to ensure understanding.

Ensure that the decimal points line up.

Continue to practise and apply the formal written method throughout Y5.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

- **Add and fractions with different denominators and mixed numbers, using the concept of equivalent fractions.**

Adding with the same denominator

$$\frac{4}{8} + \frac{1}{8} = \frac{4+1}{8} = \frac{5}{8}$$

Adding with different denominators

$$\frac{4}{8} + \frac{1}{4} =$$

Step 1 : Find ¼ equivalent fraction in 8ths

$$\frac{1}{4} = \frac{2}{8}$$

Step 2: Add fractions with the same denominator.

$$\frac{4}{8} + \frac{2}{8} = \frac{4+2}{8} = \frac{6}{8} = \frac{3}{4}$$ ← Simplified

Addition - Year Six

No objectives have been included in the programmes of study explicitly related to written methods for addition in Y6. However, there is an expectation that children will continue to practise and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate (see previous year's guidance for methods).

Our aim is that by the end of Y6, children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

- **Add fractions with different denominators and mixed numbers, using the concept of equivalent fractions.**

Adding with the same denominator

$$\frac{4}{8} + \frac{1}{8} = \frac{4+1}{8} = \frac{5}{8}$$

Adding with different denominators

$$\frac{4}{8} + \frac{1}{4} =$$

Step 1 : Find ¼ equivalent fraction in 8ths

$$\frac{1}{4} = \frac{2}{8}$$

Make equivalent fractions by finding a common denominator. Then make equivalent fractions with new denominators.

Step 2: Add fractions with the same denominator.

$$\frac{4}{8} + \frac{2}{8} = \frac{4+2}{8} = \frac{6}{8} = \frac{3}{4}$$ ← Simplified

Adding mixed numbers

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

Step 1: Add the whole numbers.

$$2 + 2 = 4$$

Step 2: Add the fractions

$$\frac{1}{6} + \frac{3}{6} = \frac{1+3}{6} = \frac{4}{6}$$

Step 3: Add whole number to the fraction.

$$4 + \frac{4}{6} = 4\frac{4}{6}$$

Stages in Subtraction

Subtraction - Early Stages (EYFS)

Children will engage in a variety of counting songs and rhymes and practical activities.

In practical activities and through discussion they will begin to use the vocabulary associated with subtraction.

They will find one less than a given number.

They will begin to relate subtraction to **'taking away'** using objects to count **'how many are left'** after some have been taken away.

6 – 2 = 4

'Take two apples away. How many are left?'

Children will begin to count back from a given number.

Subtraction - Year One

- **Given a number, identify one less**
- **Read, write and interpret mathematical statements involving subtraction (-) and the equals (=) sign**
- **Subtract one- digit and two-digit numbers within 20, including zero**
- **Solve missing number problems eg 20 -? = 15**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Children will continue to practise counting back from a given number.

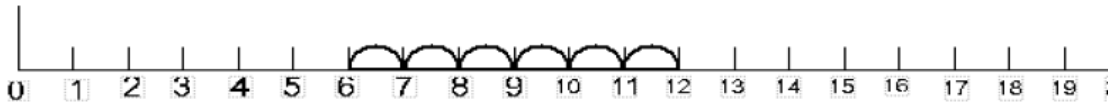
Initially use a number track to count back for subtraction:

9 – 5 = 4

'Put your finger on number nine. Count back five.'

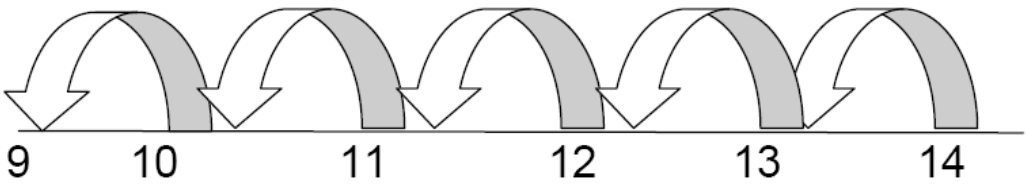
Then progress to a marked number line:

12 - 6 = 6



'Put your finger on number twelve and count back six.'

14 – 5 = 9



NB Ensure children are confident with using a marked number line before moving on to an empty number line (see year two guidance).

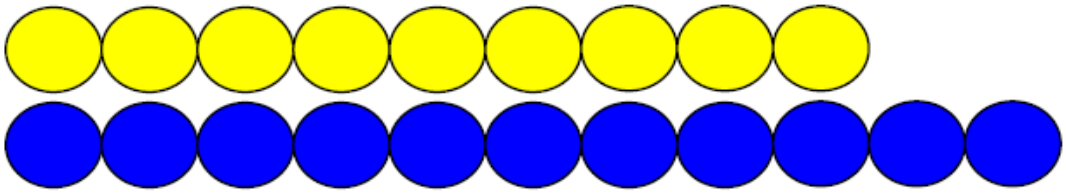
Continue to practise counting back for subtraction with numbers within 20.

Counting on to find a small difference:

Introduce complementary addition to find differences (only use for small differences). The use of models is extremely important here to understand the idea of **"difference".**

Count up from the smallest number to the largest to find the difference using resources, e.g. cubes, beads, number tracks/lines:

11 – 9 = 2



'The difference between nine and eleven is two.'

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Subtraction - Year Two

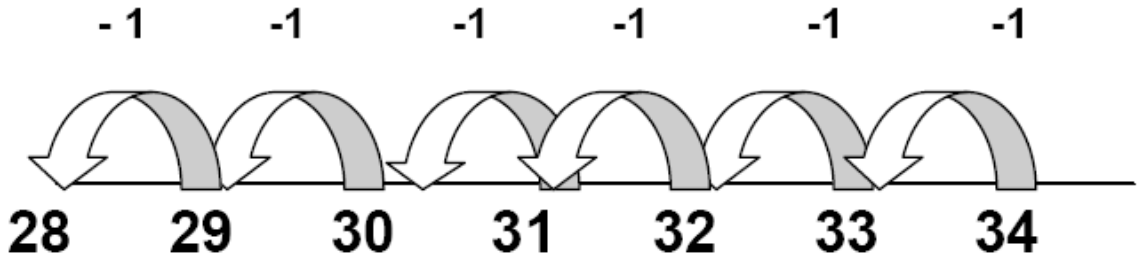
- **Subtract numbers using concrete objects, pictorial representations, and mentally, including:**

  - **A two digit number and ones**
  - **A two digit number and tens**
  - **Two two-digit numbers**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

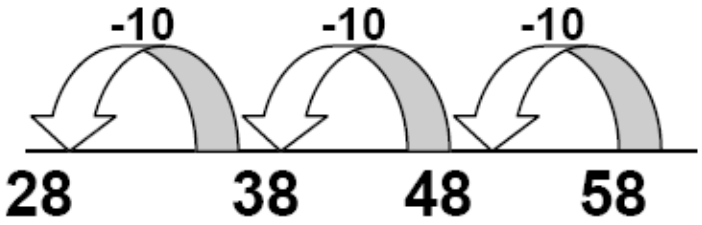
Counting back using an **empty number line** within 100, in ones…

34 - 6 = 28



…and in tens:

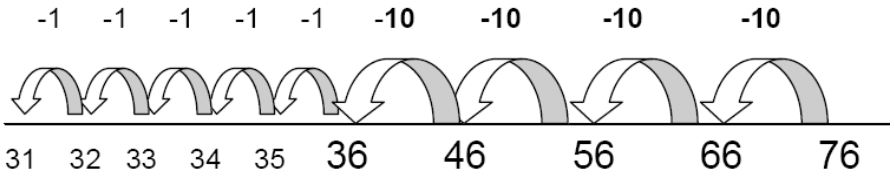
58 - 30 = 28



Use in conjunction with a 100 square to show jumps of tens.

Subtraction, using partitioning, on an empty number line:

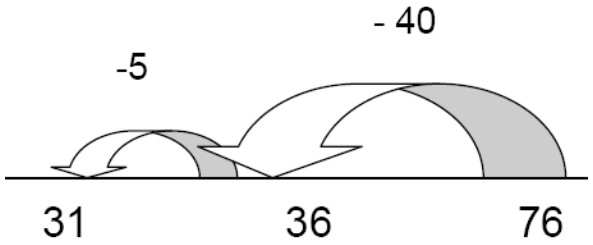
76 – 45 = 31



Use in conjunction with a 100 square to show jumps of tens and ones.

If children are confident, use more efficient jumps:

76 – 45 = 31



76 – 40 – 5 = 31

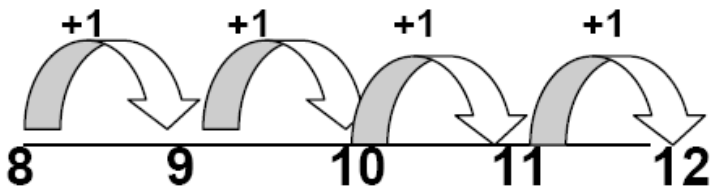
Use in conjunction with a 100 square to show jumps of tens and ones.

Counting on to find a small difference

Introduce complementary addition to find differences (only use for small differences). The use of models is extremely important here to understand the idea of **"difference"** (see Y1 guidance).

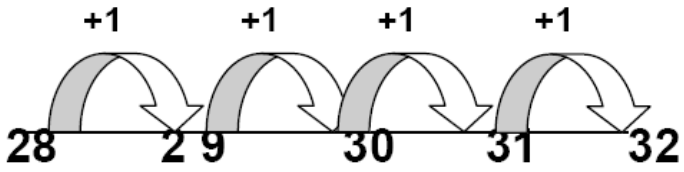
Count up from the smallest number to the largest to find the difference.

12 - 8 = 4



'The difference between 8 and 12 is 4.'

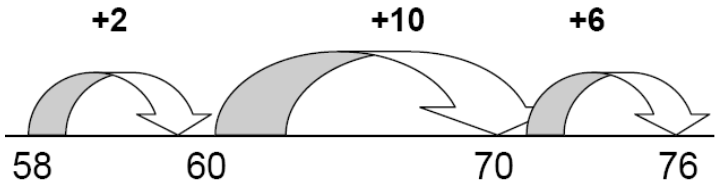
32- 28 = 4



‘The difference between 28 and 32 is 4.’

If children are confident, further develop this method:

76 – 58 = 18



‘The difference between 58 and 76 is 18.’

Further develop subtraction with numbers that bridge 100, using a 200 grid to support.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

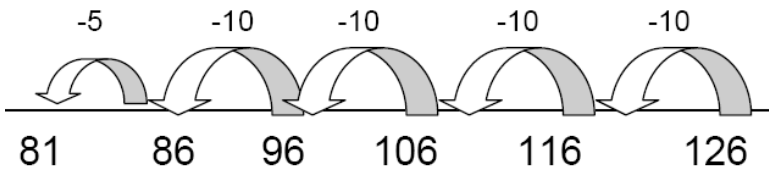
Subtraction - Year Three

- **Subtract numbers with up to three digits, using formal written method of columnar subtraction**

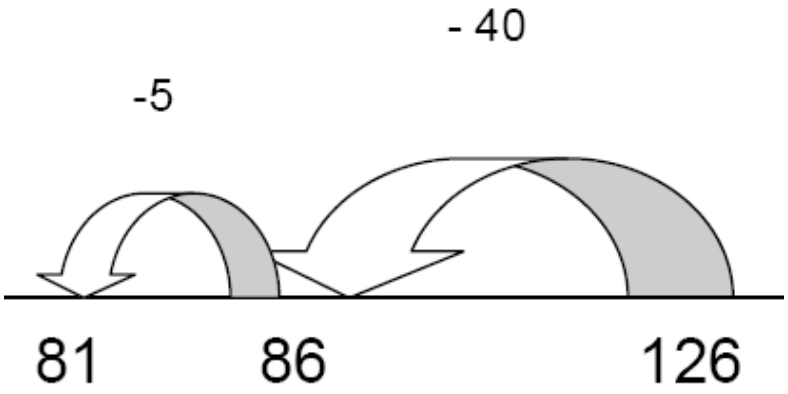
NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Further develop the use of the **empty number line** with calculations **that bridge 100**:

126 – 45 = 81

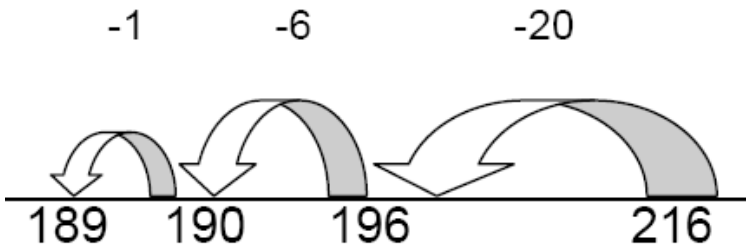


Use a 200 grid to support counting back in tens and bridging 100
Then use more efficient jumps:



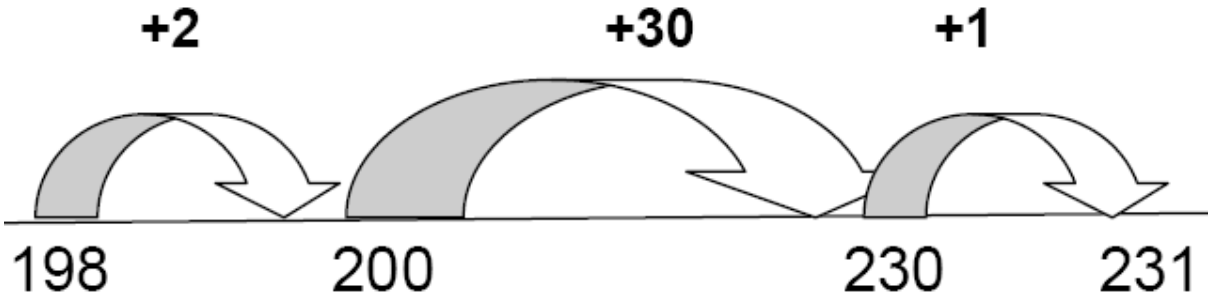
Extend with larger numbers by counting back…

216 – 27 = 189



…and by counting on to find the difference (small difference):

231 – 198 = 33



'The difference between 198 and 231 is 33.'

Introduce the **expanded written method** with the calculation presented both horizontally and vertically (in columns). Use two-digit numbers when introducing this method, initially:

78 – 23 = 55

$$\begin{array}{r} 70 + 8 \\ -\underline{20 + 3} \\ 50 + 5 = 55 \end{array}$$

'Partition numbers into tens and ones/units. Subtract the ones, and then subtract the tens. Recombine to give the answer.' ***NB*** *In this example decomposition (exchange) is not required.*

You might replace the **+ sign** with the word **'and'** to avoid confusion.

This will lead into the **formal written method**:

$$\begin{array}{r} 7\ 8 \\ -\underline{2\ 3} \\ 5\ 5 \end{array}$$

Use the language of place value to ensure understanding:

'Eight subtract three, seventy subtract twenty.'

NB A number line would be an appropriate method for this calculation but use two-digit numbers to illustrate the formal written method initially.

Introduce the **expanded written method** where exchange/decomposition is required:

73 − 27 = 46

$$\begin{array}{r} 70 + 3 \\ -\ 20 + 7 \\ \hline \end{array} \quad \text{becomes} \quad \begin{array}{r} 60 + 13 \\ -\ 20 + 7 \\ \hline 40 + 6 = 46 \end{array}$$

73 is partitioned into 60+13 in order to calculate 73-27

NB children will need to practise partitioning numbers in this way**. Base- ten materials** could be used to support this.

When children are confident with the expanded method introduce the **formal written method**, involving decomposition/exchange:

73 − 27 = 46

$$\begin{array}{r} {\scriptstyle 6\ 13} \\ 7\ 3 \\ -\ 2\ 7 \\ \hline 4\ 6 \end{array}$$

Use the language of place value to ensure understanding.

'We can't subtract seven from three, so we need to exchange a ten for ten ones to give us 60 + 13.'

*Use **base ten materials** to support understanding.*

If children are confident, extend the use of the **formal written method with numbers over 100**, returning to the expanded method first, if necessary.

235 – 127 = 108

$$\begin{array}{r} {\scriptstyle 2\ \ 15} \\ 2\,\not{3}\,\not{5} \\ -\ 1\ 2\ 7 \\ \hline 1\ 0\ 8 \end{array}$$

Use the language of place value to ensure understanding. In this example it has only been necessary to exchange from the tens column.

Use base ten materials to support understanding.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Subtraction - Year Four

- **Subtract numbers with up to 4 digits using the formal written method of columnar subtraction where appropriate**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to teach the use of **empty number lines** with three and four digit numbers, as appropriate.

Continue to develop the **formal written method of subtraction** by revisiting the expanded method first, if necessary. Continue to use **base -ten materials** to support understanding.

258 - 73 = 185

200 + 50 + 8
- 70 + 3

becomes

100 + 150 + 8
- 70 + 3
100 + 80 + 5 = 185

You might replace the + sign with the word 'and' to avoid confusion. Children will need to practise partitioning in a variety of ways.

This leads to the **formal written method**, involving decomposition…

1 15
~~2~~ 5 8
- 7 3
1 7 5

Use the language of place value to ensure understanding. In this example it has been necessary to exchange from the hundreds column.

Further develop by subtracting a three-digit number from a three-digit number:

637 – 252 = 385

600 + 30 + 7
- 200 + 50 + 2

500 + 130 + 7
- 200 + 50 + 2
300 + 80 + 5 = 385

Ensure that children are confident in partitioning numbers in this way.

This leads to a **formal written method**:

```
  5 13
  6 3 7
- 2 5 2
  3 8 5
```

Use the language of place value to ensure understanding and use base-ten materials, if necessary.

When children are confident, develop with **four digit numbers** and decimal numbers (in the context of money and measures).

3625 – 1219 = 2406

```
    1 15
  3 6 2 5
- 1 2 1 9
  2 4 0 6
```

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Year Five – Subtraction

- **Subtract whole numbers with more than 4 digits, including using formal written method (columnar subtraction)**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to teach the use of **empty number lines** with larger numbers and decimals,
as appropriate.

Continue to develop the **formal written method** for subtraction with three and four digit numbers (see Y4 guidance), returning to an **expanded method** and using base ten materials, if necessary.

503 – 278 = 225

$$\begin{array}{r} 500 + 0 + 3 \\ -\ 200 + 70 + 8 \\ \hline \end{array} \qquad \begin{array}{r} 400 + 90 + 13 \\ -\ 200 + 70 + 8 \\ \hline 200 + 20 + 5 \end{array}$$

In this example 503 has to be partitioned into 400+90+13 in order to carry out the subtraction calculation.

This leads into the **formal written method** (there is potential for error in this example):

$$\begin{array}{r} {}^{4}\cancel{5}\ {}^{9}\cancel{0}\ {}^{13}\cancel{3} \\ -\ 2\ 7\ 8 \\ \hline 2\ 2\ 5 \end{array}$$

There are no tens in the first number (503) so we have to exchange a hundred for 10 tens before we can exchange a ten for ten ones/units

NB It would be appropriate to discuss the use of mental calculation methods with an example like this one, i.e. would an empty number line be a more efficient method for these numbers?

When children are confident extend with larger numbers (and decimal numbers). Return to an expanded method, if necessary.

12731 – 1367 = 11364

```
      6  12  11
   1 2  7  3  1
 -    1  3  6  7
 ---------------
   1  1  3  6  4
```

In this example it has been necessary to exchange from the tens and the hundreds columns.

NB If children are making significant errors, provide calculations where only one exchange is required.

Introduce subtraction of decimals, initially in the context of money and measures.

£166.25 – £83.72 = £82.53

```
     16  5   12
   1  6  6 . 5
 -    8  3 . 7  2
 ---------------
      8  2 . 5  3
```

Ensure the decimal points line up.

Continue to practise and apply the formal written method with large numbers and decimals throughout year five.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Year Six – Subtraction

No objectives have been included in the programmes of study explicitly related to written methods for subtraction in Y6. However, there is an expectation that children will continue to practice and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate (see previous years' guidance for methods).

Our aim is that by the end of Y6 children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

Stages in Multiplication

Multiplication – Early Stages (EYFS)

Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving doubling.

‘Three apples for you and three apples for me. How many apples altogether?’

Multiplication – Year One

- **Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher**

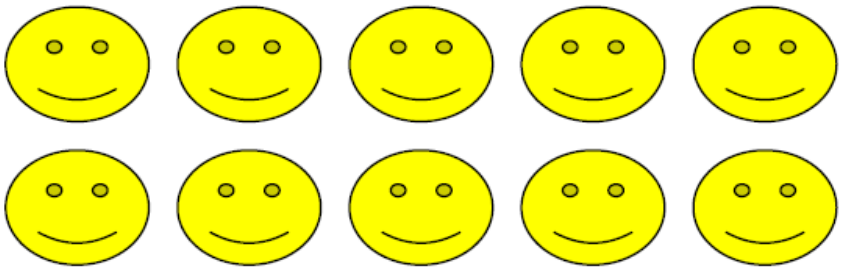
- **Count in multiples of twos, fives and tens (to the 10th multiple)**

Children will count repeated groups of the same size in practical contexts. They will use the vocabulary associated with multiplication in practical contexts. They will solve practical problems that involve combining groups of 2, 5 or 10. e.g. socks, fingers and cubes.

'Six pairs of socks. How many socks altogether? 2, 4, 6, 8, 10, 12'

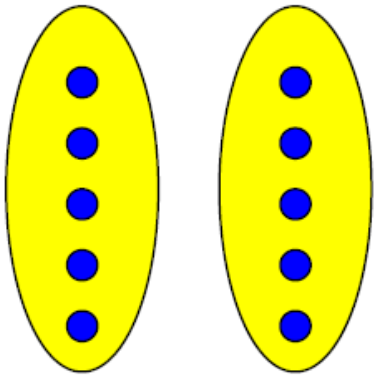
'Three pots of ten crayons. How many crayons altogether? 10, 20, 30'

Use **arrays** to support early multiplication



'**Five groups of two faces. How many faces altogether? 2, 4, 6, 8, 10'**

‘Two groups of five faces. How many faces altogether? 5, 10’



‘2 groups of 5’
‘How many altogether?’
‘5 + 5 = 10’
Double five is ten

Continue to solve problems in **practical contexts** and develop the language of early multiplication, with appropriate resources, throughout Y1.

Multiplication - Year Two

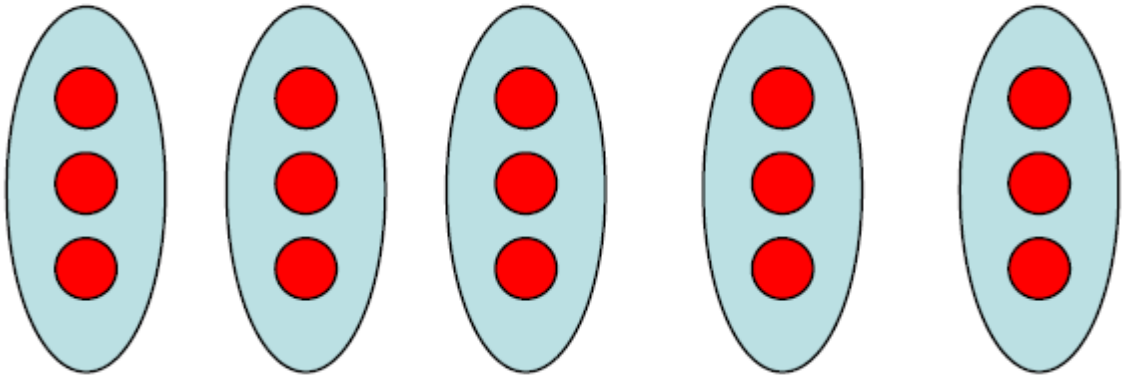
- **Recall and use multiplication facts for the 2, 5 and 10 multiplication tables**
- **Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs**
- **Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts**
- **Show that multiplication of two numbers can be done in any order (commutative)**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Children will use a range of vocabulary to describe multiplication and use practical resources, pictures, diagrams and the x sign to record.

Combining Groups (repeated addition):

'3 groups of 10 crayons'
'How many crayons altogether?'
'10 + 10 + 10 = 30'
'3 groups of 10' '3 times ten'
'3 x 10 = 30' '10 x 3 = 30'



'5 groups of 3' '5 lots of 3' '3 + 3 + 3 + 3 +3 = 15'
'5 times 3' '3 multiplied by 5' '5 x 3 = 15' '3 x 5 = 15'

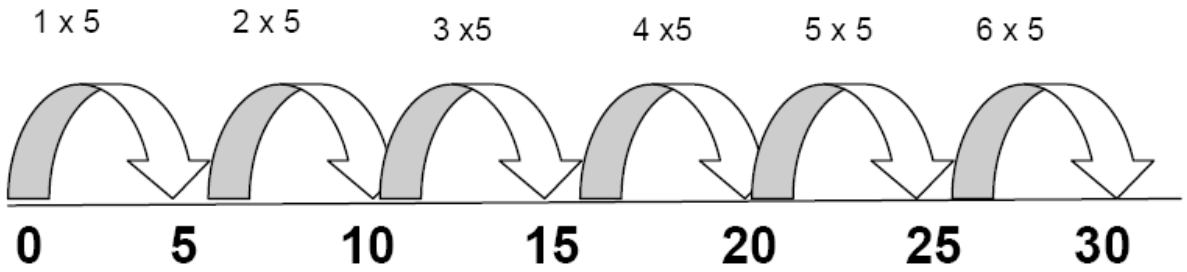
Using arrays to support multiplication:

6 x 5 = 30

'5 + 5 + 5 + 5 + 5 + 5 = 30 '
'6 rows of 5'
'6 groups of 5'
'5 groups of 6'
'5 x 6 = 30'
'6 x 5 = 30'

Using an empty number line:

6 x 5 = 30



Make the link to repeated addition.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

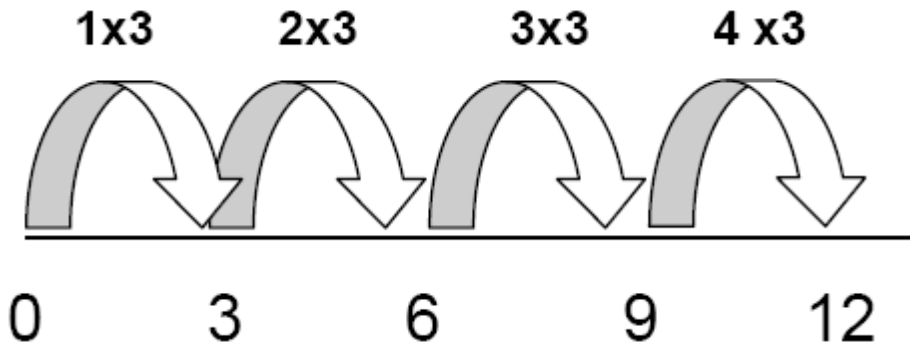
Multiplication - Year Three

- **Recall and use multiplication facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables)**
- **Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to a formal written method**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use **number lines** and **arrays** to support multiplication, as appropriate (see Y2 guidance).

4 x 3 = 12

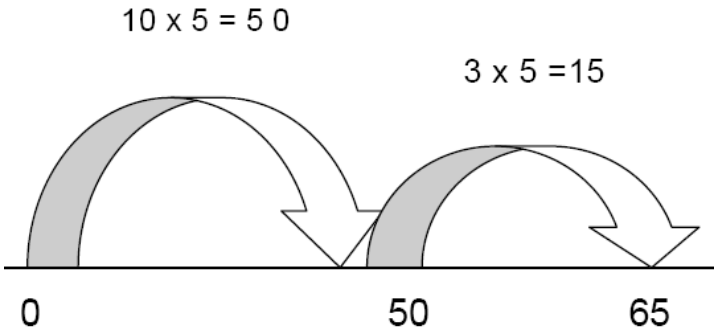


Partitioning method for multiplication of a teen number by a one-digit number:
13 x 5 = 65 (Partition 13 into 10 + 3)

10 x 5 = 50
3 x 5 = 15

50 + 15 = 65

Demonstrate the partitioning method using a number line:
13 x 5 = 65



Grid Method (teen number multiplied by a one- digit number):

13 x 8 = 104

X	10	3
8	80	24

80 + 24 = 104

Formal short multiplication:

```
  1 3
X   8
 1 0 4
   2
```

Ensure that the digit 'carried over' is written under the line in the correct column.

Use the language of place value to ensure understanding.

Continue to develop the formal written method of multiplication throughout year three using teen- numbers multiplied by a one-digit number.

If children are confident progress to multiplying other two-digit numbers by a one digit number (see Y4 guidance).

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Multiplication- Year Four

- **Recall multiplication facts for multiplication tables up to 12 × 12**
- **Multiply two-digit and three-digit numbers by a one-digit number using formal written layout**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use **empty number lines**, as appropriate (see Y3 guidance).

Further develop the **grid method** for two-digit numbers multiplied by a one- digit number.

36 x 4 = 144

X	30	6
4	120	24

120 + 24 = 144

This leads to **short multiplication (formal method)** of a two–digit number multiplied by a one- digit number:

36 x 4 = 144

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

Use the language of place value to ensure understanding.

Ensure that the digit 'carried over' is written under the line in the correct column.

Continue to practise the formal method of short multiplication of a two-digit number by a one -digit number throughout Y4.

If children are confident, continue to develop short multiplication with three- digit numbers multiplied by a one-digit number.

If necessary, return to the grid method first:

127 x 6 = 762

X	100	20	7
6	600	120	42

```
  6 0 0
  1 2 0
+   4 2
  7 6 2
```
(Add the partial products)

This will lead into **short multiplication (formal method):**

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

Use the language of place value to ensure understanding.

Ensure that the digits 'carried over' are written under the line in the correct column.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Multiplication - Year Five

- **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**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Build on the work covered in Y4 with the **formal method of short multiplication** (two-digit number multiplied by a one-digit number).

When children are confident introduce multiplication by a two-digit number. If necessary, return to the grid method and/or expanded method first.

Grid method (two-digit number multiplied by a teen- number):
23 x 13 = (20 + 3) x (10 + 3) = 299

X	20	3
10	200	30
3	60	9

Add partial products (200 + 3) + (60 + 9) = 299

$$\begin{array}{r} 230 \\ +\ 69 \\ \hline 299 \end{array}$$

This leads into…

Compact long multiplication (formal method):
23 x 13 = 299

```
    2 3
X   1 3
  + 6 9  (3 x 23)
  2 3 0  (10 x 23)
  2 9 9
```

When children are confident with **long multiplication** extend with three-digit numbers multiplied by a two-digit number, returning to the **grid method** first, if necessary:

124 x 26 = 3224

```
    1 2 4
  X 2 6
    7¹4²4     (6x124)
+ 2 4 8 0     (20x124)
  3 2 2 4
  1 1
```

Use the language of place value to ensure understanding.

Add the partial products.

The prompts (in brackets) can be omitted if children no longer need them.

Extend with **short and long multiplication** of decimal numbers (initially in the context of money and measures), returning to an expanded method first, if necessary (see Y6 guidance).

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Multiplication - Year Six

- **Multiply multi-digit numbers (including decimals) up to 4 digits by a two-digit whole numbers**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to practise and develop the **formal short multiplication method and formal long multiplication method** with larger numbers and decimals throughout Y6.

The **grid method** (decimal number multiplied by a two-digit number):
53·2 x 24 = 1276·8

X	50	3	0.2	
20	1000	60	4	**1064**
4	200	12	0.8	**212.8**

1064
\+ 212.8
1276.8

The formal written method of long multiplication:

53.2 X 24 =

5 3 ·2
x 2 4 ·0
2 1¹ 2 ·8 (53·2 x 4)
1 0 6 4 ·0 (53·2 x 20)
1 2 7 6 ·8

It is an option to include ·0 in this example, but not essential.

The prompts (in brackets) can be omitted if children no longer need them.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Our aim is that by the end of Y6 children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

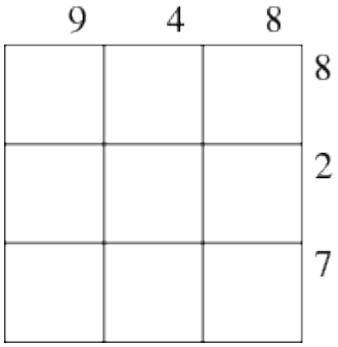
Lattice Method

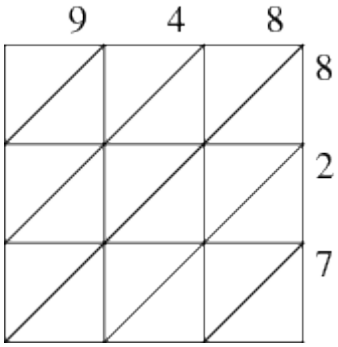
The lattice method is an alternative to long multiplication for numbers. In this approach, a lattice is first constructed, sized to fit the numbers being multiplied.

948 x 827 = 783996

The multiplicand is placed along the top of the lattice so that each digit is the header for one column of cells (the most significant digit is put at the left). The multiplier is placed along the right side of the lattice so that each digit is a (trailing) header for one row of cells (the most significant digit is put at the top).

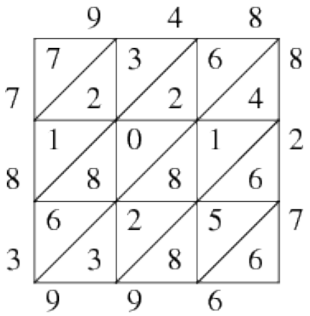
Before the actual multiplication can begin, lines must be drawn for every diagonal path in the lattice from upper right to lower left to bisect each cell. There will be 5 diagonals for our 3×3 lattice array.





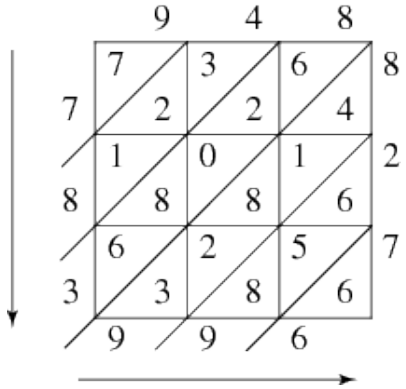
Now we calculate a product for each cell by multiplying the digit at the top of the column and the digit at the right of the row. The tens digit of the product is placed above the diagonal that passes through the cell, and the units digit is put below that diagonal. If the product is less than 10, we enter a zero above the diagonal.

Now we are ready to calculate the digits of the product. We sum the numbers between every pair of diagonals and also between the first (and last) diagonal and the corresponding corner of the lattice. We start at the bottom half of the lower right corner cell (6). This number is bounded by the corner of the lattice and the first diagonal. Since this is the only number below this diagonal, the first sum is 6. We place the sum along the bottom of the lattice below the rightmost column.



Next we sum the numbers between the previous diagonal and the next higher diagonal: 6+5+8=19 . We place the 9 just below the bottom of the lattice and carry the 1 into the sum for the next diagonal group. (The diagonals are extended for clarity.)

We continue summing the groups of numbers between adjacent diagonals, and also between the top diagonal and the upper left corner. The final product is composed of the digits outside the lattice which were just calculated. We read the digits down the left side and then towards the right on the bottom to generate the final answer: 783996.



Stages in Division

Division – Early stages (EYFS)

Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving halving and sharing.

Share the apples between two people.

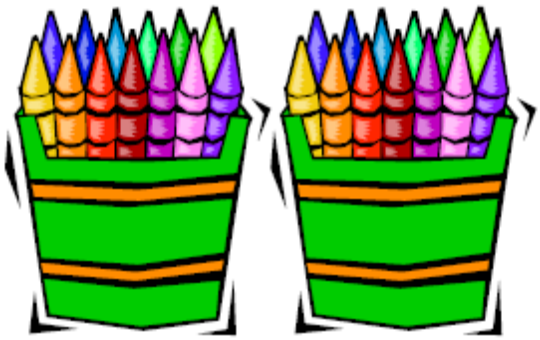
‘Half of the apples for you and half of the apples for me.’

Division - Year One

- **Solve one-step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher**
- **Count in multiples of twos, fives and tens (to the 10th multiple)**

Children will start with practical **sharing** using a variety of resources.
They will share objects into **equal groups** in a variety of situations.
They will begin to use the vocabulary associated with division in practical contexts.

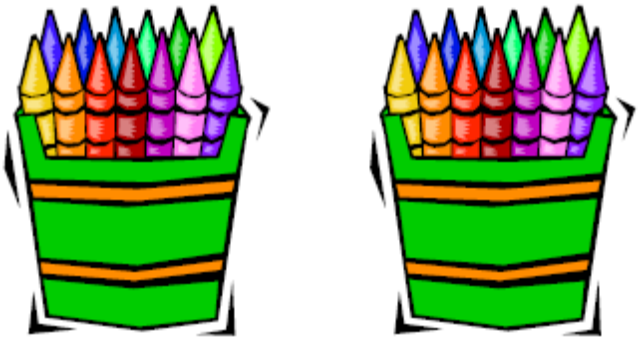
'Share these eight apples equally between two children. How many apples will each child have?'



'Share 20 crayons between 2 pots.'

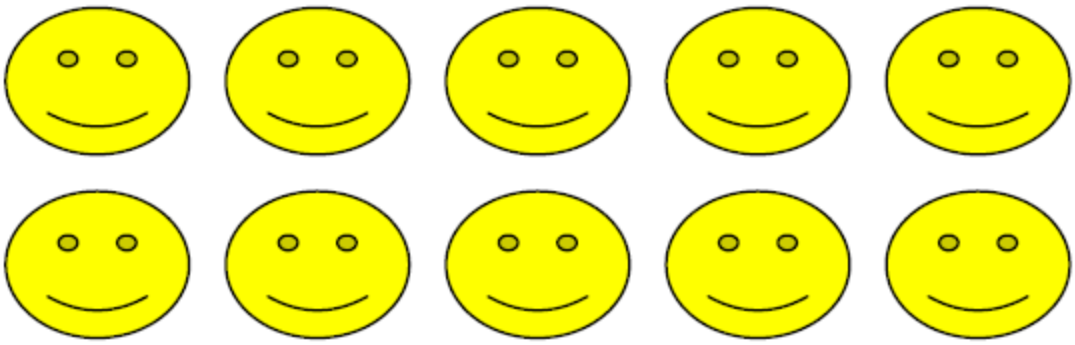
'How many crayons are in each pot?'

Children will move from **sharing** to **grouping** in a practical way

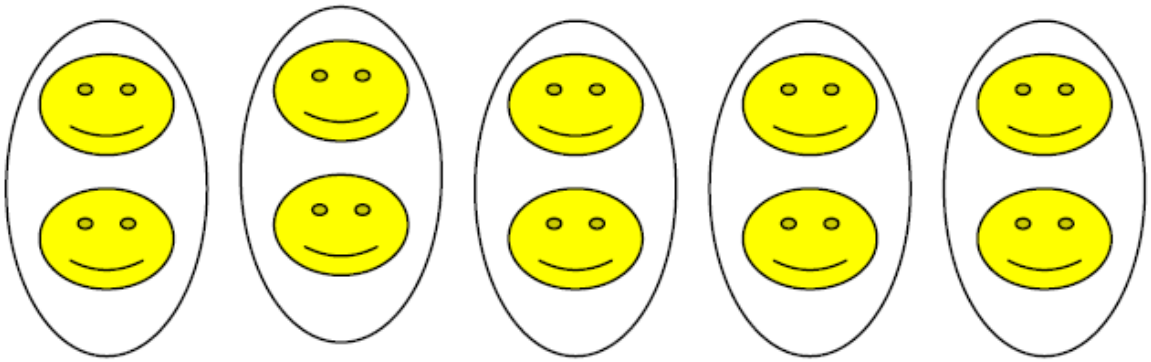


'Put 20 crayons into groups of 10. How many pots do we need?'

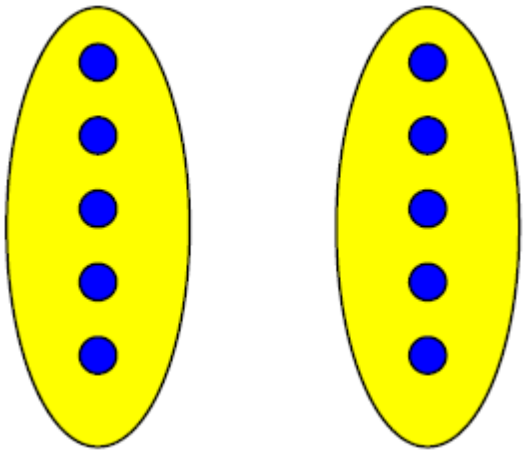
Use **arrays** to support early division



‘How many faces altogether? How many groups of two?’



‘Five groups of two’



‘How many groups of 5?’

‘10 shared equally between 2 people’

‘Half of ten is five’

Continue to solve problems in practical contexts throughout Y1, and develop the language of early division, with appropriate resources.

Division - Year Two

- **Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables**
- **Calculate mathematical statements for division within the multiplication tables they know and write them using the division (÷) and equals (=) signs**
- **Solve problems involving division, using materials, arrays, repeated subtraction, mental methods, and multiplication and division facts, including problems in contexts**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Children will use a range of vocabulary to describe division and use practical resources, pictures, diagrams and the ÷sign to record, using multiples that they know.

Sharing and grouping:

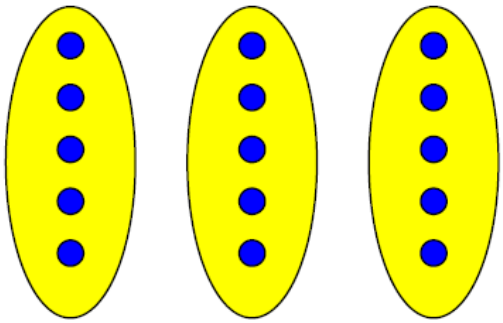
'30 crayons shared equally between three pots.' (Sharing)

'We have 30 crayons and put ten crayons in each pot.

How many pots do we need?' (Grouping)

'30 divided by 10 = 3'
'30 divided by 3= 10'

30 ÷ 10 = 3
30 ÷ 3 = 10



'How many groups of 5?'
'15 shared equally between 3 people is…?'

'15 divided by 3 equals 5'
'15 divided by 5 equals 3'

15 ÷ 5 = 3
15 ÷ 3 = 5

Using **arrays** to support division

15 ÷ 5 = 3

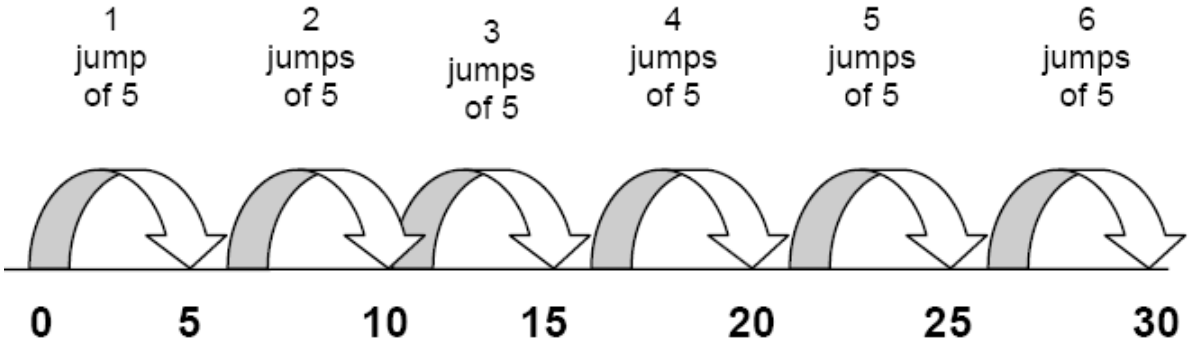
15 ÷ 3= 5

How many groups of 3?
How many groups of 5?
15 shared between 3 people is…?
15 shared between 5 people is…?
15 divided by 5 = 3
15 divided by 3 = 5

When children are ready, use an empty number line to count forwards:

30 ÷ 5 = 6

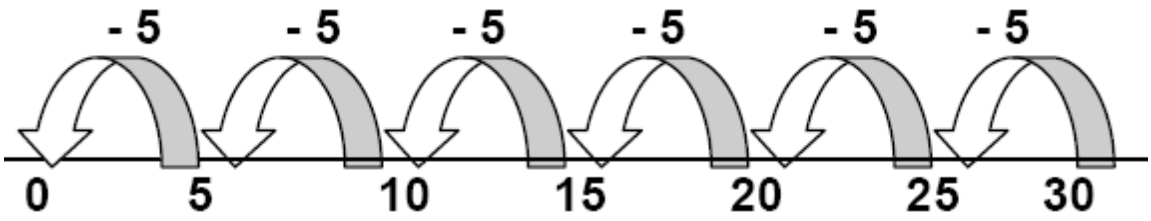
'How many jumps of five make thirty?'



Also jump back to make the link with repeated subtraction:

30 ÷ 5 = 6

'How many groups of five?'



NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Year Three – Division

- **Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables)**
- **Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, using mental and progressing to a formal written method**

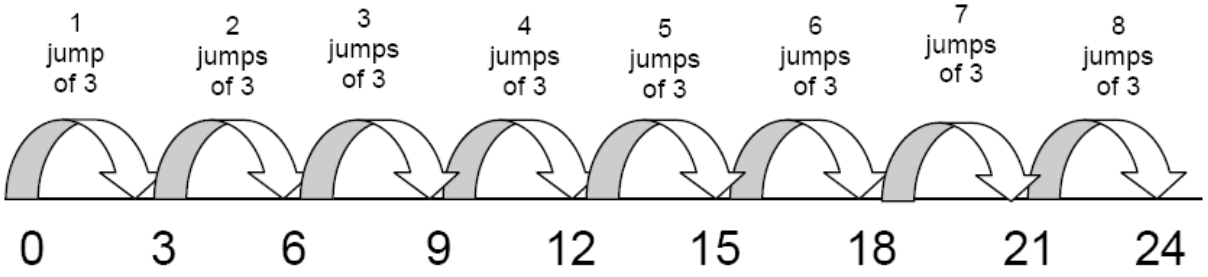
NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use practical resources, pictures, diagrams, number lines, arrays and the ÷ sign to record, using multiples that they know, as appropriate (see Y2 guidance).

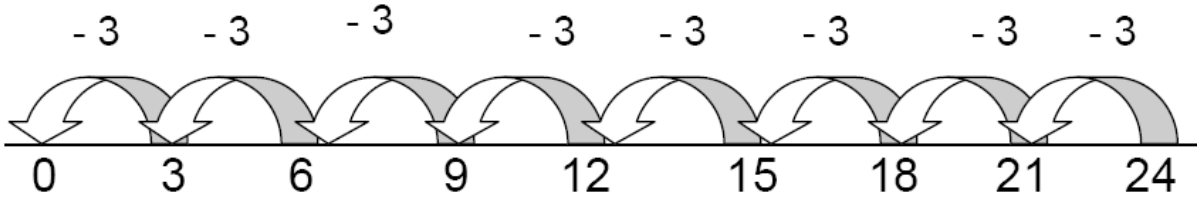
Using an empty number line to count forwards…

24 ÷ 3 = 8

'How many threes in 24?'



…also jump back from 24 to make the link with repeated subtraction.

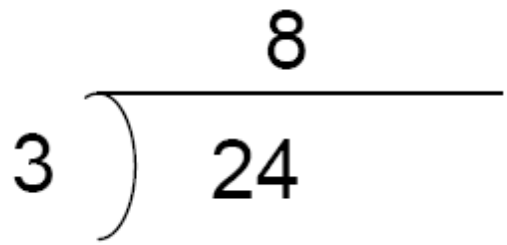


'How many groups of three in 24?'

Introduce the formal layout using multiplication/division facts that the children know:

$24 \div 3 = 8$

This can also be recorded as…



‘Twenty four divided by three equals eight.’

‘How many threes are there in twenty four?’

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Year Four- Division

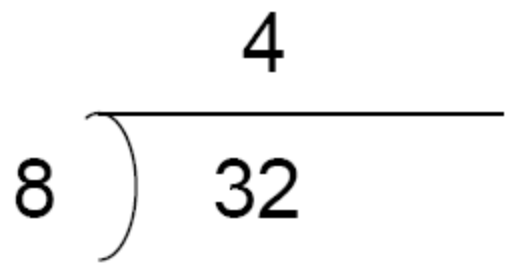
- **Recall multiplication and division facts for multiplication tables up to 12 × 12**
- **Use place value, known and derived facts to divide mentally**
- **Divide two-digit and three-digit numbers by a one-digit number using formal written layout**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to write and calculate mathematical statements for division using the multiplication tables that the children know e.g.

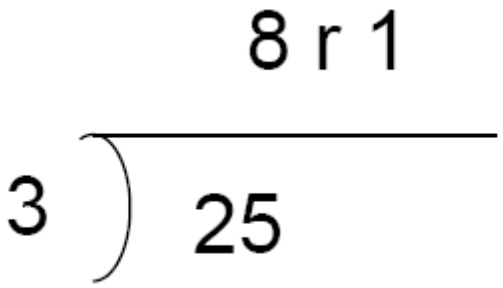
32 ÷ 8 = 4

Continue using the **formal written** layout for division using multiplication tables that they know:



'How many eights are there in thirty two?'

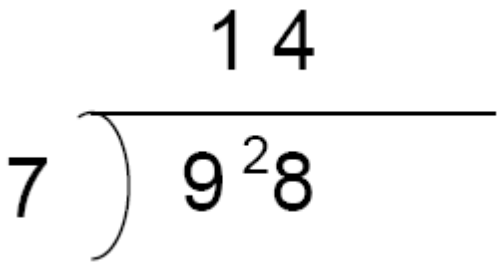
Continue using the formal written layout, introducing remainders:
25 ÷ 3 = 8 r1



NB Remainders are not specifically referred to until Y5 in the National Curriculum. However, this may be an appropriate point to introduce them using familiar multiplication facts.

This will lead into the formal written method of short division:

98 ÷ 7 = 14



Use the vocabulary of place value to ensure understanding and make the link to partitioning.

Continue to practise the **formal method of short division** throughout Y4.

If children are confident develop further, by dividing three-digit numbers by a one digit number using the formal method of short division with whole number answers (no remainders).

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

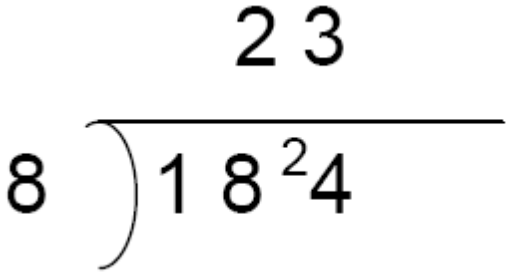
Year Five - Division

- **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**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to practise the formal written method of short division with whole number answers…

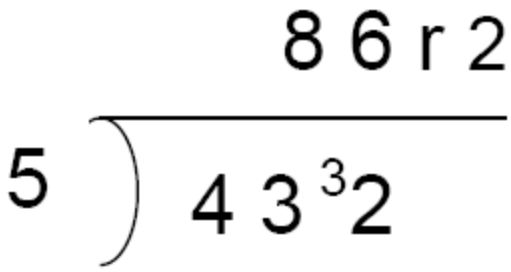
184 ÷ 8 = 23



Use the language of place value to ensure understanding. Make the link to the partitioning method (see Y4 guidance).

…and with remainders:

432 ÷ 5 = 86 r2



The remainder can also be expressed as a fraction, $\frac{2}{5}$ (the remainder divided by the divisor): $432 \div 5 = 86\frac{2}{5}$

Continue to practise, develop and extend the formal **method of short division**, with and without remainders. Interpret and express remainders according to the context.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Year Six – Division

- **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**
- **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**

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on

Continue to practise the **formal method of short division, with and without remainders**, using the language of place value to ensure understanding (see Y5 guidance).

496 ÷ 11 = 45 r1

$$11 \overline{)\,49^{5}6} \quad 45\ r\ 1$$

The remainder can also be expressed as a fraction 1/11 , (the remainder divided by the divisor)

Dividing by a two-digit number using a **formal method of long division**:

```
      45 r 1
   ___________
11 ) 4 9 6
     -4 4 0   (40 x 11)
       5 6
     - 5 5   (5 x 11)
         1   (remainder)
```

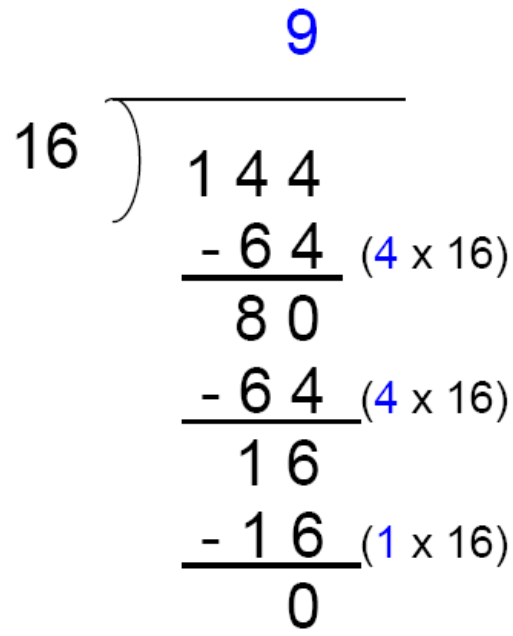
Multiples of the divisor (11) have been subtracted from the dividend (496)

'40 (lots of 11) + 5 (lots of 11) = 45 (lots of 11)'
'1 is the remainder'

Answer: 45 1/11

Standard short division does not help with the following calculation. However, it can be solved using long division (by repeated subtraction using multiples of the divisor):

144÷ 16 = 9



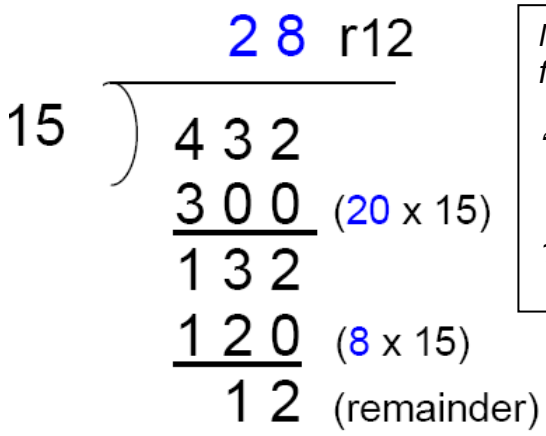
Multiples of the divisor (16) have been subtracted from the dividend (144)

'4 (lots of 16) + 4 (lots of 16) + 1 (lot of 16) = 9 (lots of 16)

There is no remainder'

Children will need to select the most effective method for each calculation/problem they meet, including whether to use the standard, formal written method of long division:

432 ÷ 15 = 28 r12



Multiples of the divisor (15) have been subtracted from the dividend (432)

'20 (lots of 15) + 8 (lots of 15) = 28

12 is the remainder'

The remainder can also be expressed as a fraction 12/15 , (the remainder divided by the divisor) or as a decimal, 0.8 (see next example)

The answer is: 28 12/15 or 28·8

NB If, at any time, children are making significant errors, return to the previous stage in calculation.

Our aim is that by the end of Y6 children use **mental methods** (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient **formal written method** accurately and with confidence.