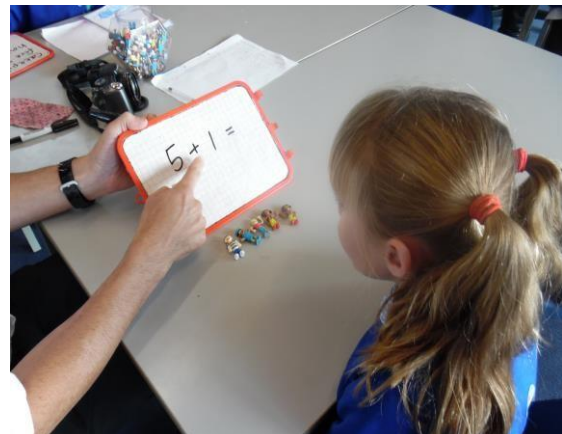
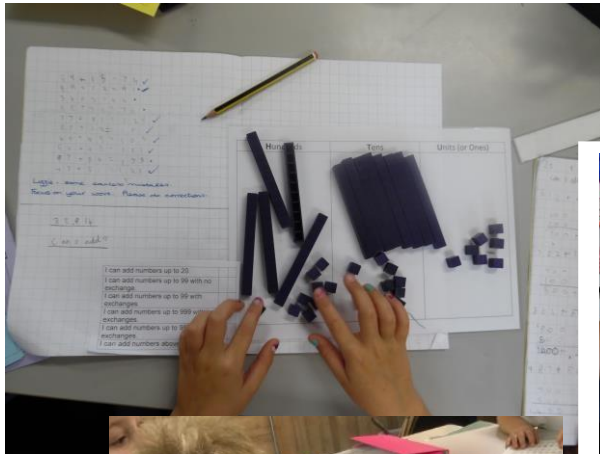




GREAT BINFIELDS PRIMARY SCHOOL

Calculation Policy



Learning together, achieving forever!

Progression towards a standard written method of calculation

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.

A separate mental maths policy outlines mental calculation strategies, including the use of jottings, vocabulary to be developed and the key number facts that children will need to know.

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

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

HOW TO USE THIS POLICY

- γ Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning
- γ Always use Assessment for Learning to identify suitable next steps in calculation for groups of children
- γ If, at any time, children are making significant errors, return to the previous stage in calculation
- γ Cross reference with the mental maths policy for guidance on key facts, key vocabulary and mental methods
- γ Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate
- γ 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 are there altogether?'

Addition - Year One

- Y Given a number, identify one more
- Y Read, write and interpret mathematical statements involving addition (+) and the equals (=) sign
- Y Add one-digit and two-digit numbers within 20, including zero
- Y Solve missing number problems e.g. $10 + \square =$

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:

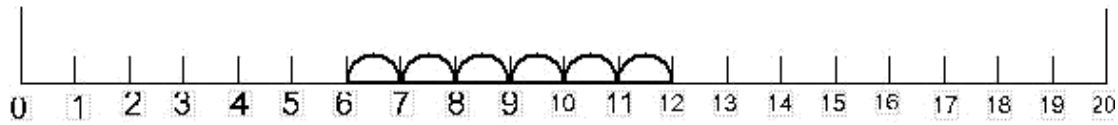


$$5 + 4 = 9$$

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

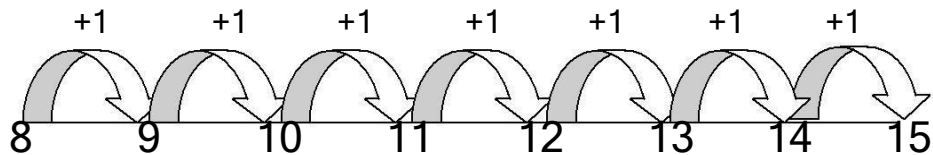
Then progress to a marked number line:

$$6 + 6 = 12$$



'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.

Addition - Year Two

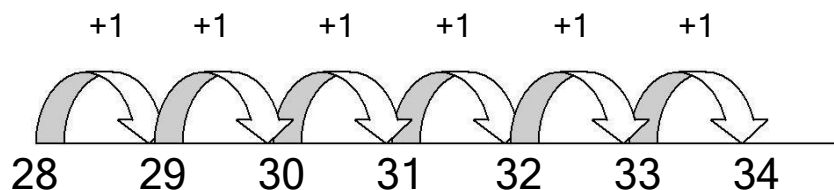
Y Add numbers using concrete objects, pictorial representations, and mentally, including:

- A two-digit number and ones
- A two-digit number and tens
- Two two-digit numbers
- Three one-digit numbers (see mental maths policy)

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

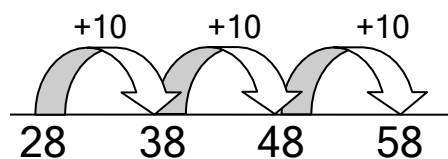
Counting on in ones using an empty number line, within 100...

$$28 + 6 = 34$$



...and in tens

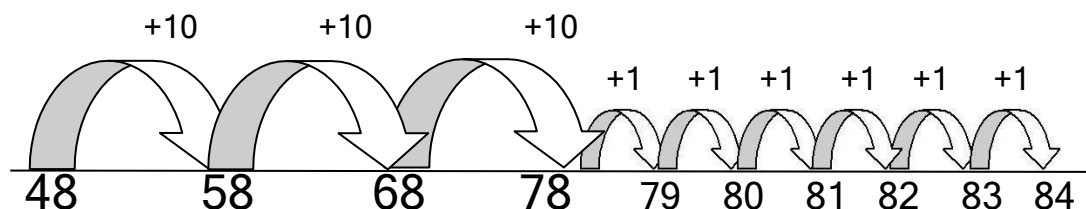
$$28 + 30 = 58$$



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

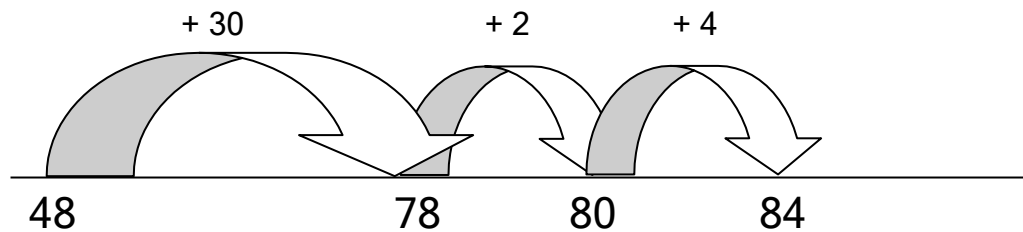
$$48 + 36 = 84$$

'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.

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

$$\begin{array}{r} 43 + 25 = 68 \\ \diagdown \quad \diagup \quad \diagdown \quad \diagup \\ 40 \quad 3 \quad 20 \quad 5 \end{array}$$

$$40 + 20 = 60$$

$$3 + 5 = 8$$

$$60 + 8 = 68$$

'Partition the numbers into tens and ones.

Add the tens together and then add the ones 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.

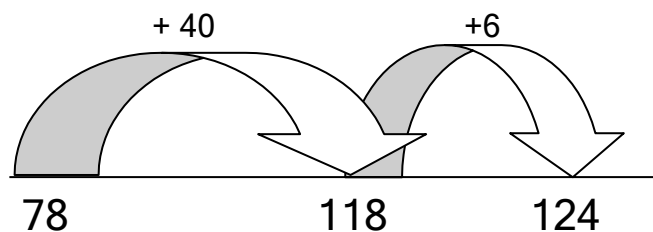
Addition - Year Three

Y 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:

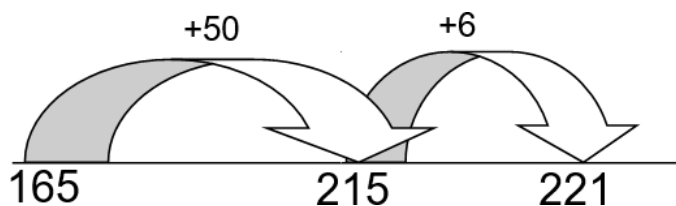
$$78 + 46 = 124$$



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:

$$63 + 32 = 95$$

$$\begin{array}{r} 60 + 3 \\ + \underline{30 + 2} \\ 90 + 5 = 95 \end{array}$$

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

Then...

$$\begin{array}{r} + \quad 63 \\ \quad \underline{32} \\ + \quad 5 (3 + 2) \\ \underline{90} (60 + 30) \\ 95 \end{array}$$

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

This will lead into the formal written method...

$$\begin{array}{r} 63 \\ + \underline{32} \\ 95 \end{array}$$

Use the language of place value to ensure understanding: 'Three add two equals five. Write five in the ones column. 60 add 30 equals 90. Write 9 (90) in the tens column.'

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:

$$68 + 24 = 92$$

$$\begin{array}{r} 60 + 8 \\ + \underline{20 + 4} \\ 80 + 12 = 92 \end{array}$$

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

Then...

$$\begin{array}{r} 68 \\ + 24 \\ \hline 12 \quad (8 + 4) \\ + 80 \quad (60 + 20) \\ \hline 92 \end{array}$$

Add the ones 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 'exchange' ten from the ones to the tens column:

$$\begin{array}{r} 68 \\ + 24 \\ \hline 1 \\ \hline 92 \end{array}$$

Use the language of place value to ensure understanding: 'Eight add four equals 12. Write two in the ones column and 'exchange' the 10 ones for a ten; carry a one (10) across into the tens column. 60 add 20 and the ten that we 'exchanged' across (carried) equals 90. Write 9 (90) in the tens column. 92 is the answer.'

The digit that has been 'exchanged' should be recorded above 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:

$$76 + 47 = 123$$

$$\begin{array}{r} 70 + 6 \\ + 40 + 7 \\ \hline 110 + 13 = 123 \end{array}$$

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

Then...

$$\begin{array}{r} 76 \\ 47 \\ \hline + 13 \quad (7 + 6) \\ \hline 110 \quad (70 + 40) \\ \hline 123 \end{array}$$

Add the ones 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 'exchange' across the columns and bridge 100:

$$76 + 47 = 123$$

$$\begin{array}{r} + \quad 47 \\ \quad 76 \\ \hline \quad 11 \\ \hline 123 \end{array}$$

Use the language of place value to ensure understanding: 'Seven add six equals 13. Write three in the ones column and 'exchange' one (10) across into the tens column. 40 add 70 and the ten that we 'exchanged' equals 120. Write 2 (20) in the tens column and 'exchange' one (100) across into the hundreds column (100).

The digits that have been 'exchanged' should be recorded above 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:

$$178 + 43 = 221$$

$$\begin{array}{r} 178 \\ + 43 \\ \hline 11 \\ \hline 221 \end{array}$$

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

Addition - Year Four

Y Add numbers with up to four 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:

$$176 + 147 = 323$$

$$\begin{array}{r} 176 \\ + 147 \\ \hline 13 \quad (7 + 6) \\ + 110 \quad (70 + 40) \\ \hline 200 \quad (100 + 100) \\ \hline 323 \end{array}$$

This may also be shown as:

$$\begin{array}{r} 100 \quad 70 \quad 6 \\ 100 \quad 40 \quad 7 \quad + \\ \hline 200 \quad 110 \quad 13 \quad = 323 \end{array}$$

This will lead into the formal written method...

$$176 + 147 = 323$$

$$\begin{array}{r} 147 \\ + 176 \\ \hline 1 \quad 1 \\ \hline 323 \end{array}$$

Use the language of place value to ensure understanding:

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

The digits that have been 'exchanged' should be recorded above the line in the correct column.

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

$$1,845 + 526 = 2,371$$

$$\begin{array}{r} 1845 \\ + 526 \\ \hline 2371 \end{array}$$

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

$$54.75 + 33.86 =$$

$$\begin{array}{r} 54.75 \\ + 33.86 \\ \hline 88.61 \end{array}$$

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

Addition - Year Five

Y Add whole numbers with more than four digits (up to seven-digit numbers), 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 use of empty number lines with larger numbers (and decimals) as an informal strategy, where 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:

$$21,848 + 1,523 = 23,371$$

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

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

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

$$£154.75 + £233.82 = £388.57$$

$$\begin{array}{r} 154.75 \\ + 233.82 \\ \hline 388.57 \end{array}$$

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.

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 and are able to use an efficient formal written method accurately and with confidence.

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

- Y Given a number, identify one less
- Y Read, write and interpret mathematical statements involving subtraction (-) and the equals (=) sign
- Y Subtract one-digit and two-digit numbers within 20, including zero
- Y Solve missing number problems e.g. $20 - \square = 15$

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:

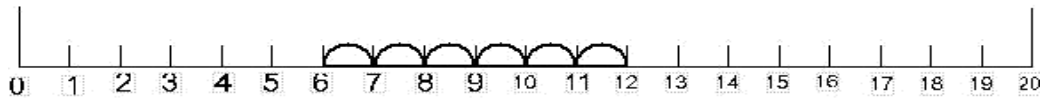


$$9 - 5 = 4$$

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

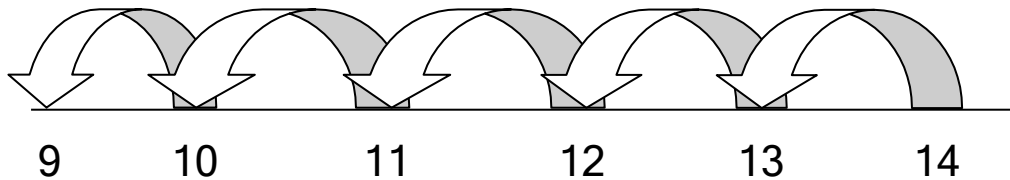
Then progress to a marked number line:

$$12 - 6 = 6$$



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

$$14 - 5 = 9$$



'Put your finger on number 14 and count back five.'

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

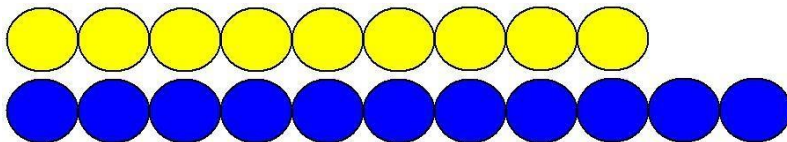
Continue to practise counting back for subtraction with numbers within 20.

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

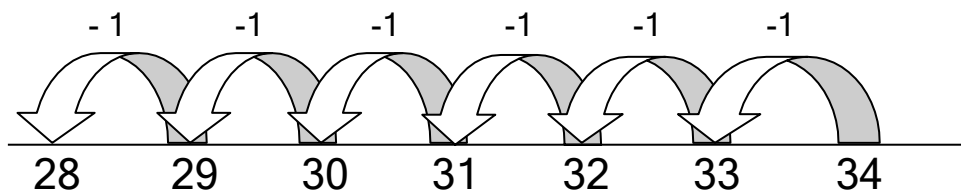
Y Subtract numbers using concrete objects, pictorial representations, and mentally, including:

- 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.

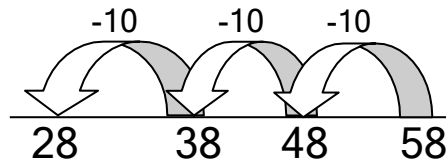
Counting back using an empty number line within 100, in ones...

$$34 - 6 = 28$$



...and in tens:

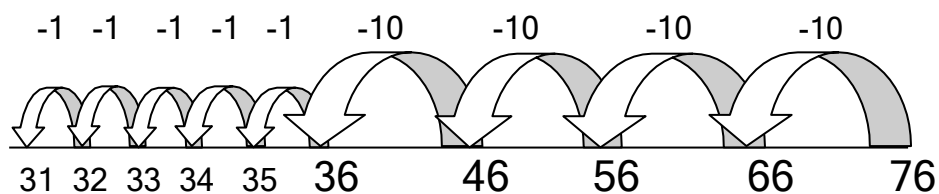
$$58 - 30 = 28$$



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

Subtraction, using partitioning, on an empty number line:

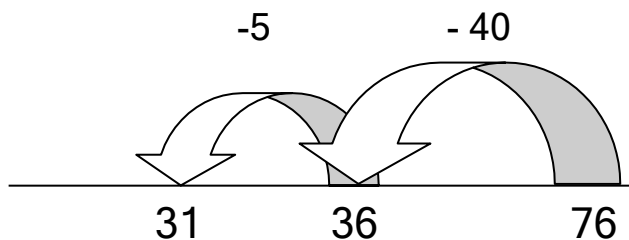
$$76 - 45 = 31$$



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

If children are confident, use more efficient jumps:

$$76 - 45 = 31$$



$$76 - 40 - 5 = 31$$

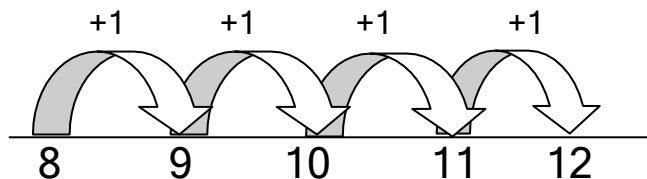
Use in conjunction with a 100 square to show jumps of tens and ones.

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).

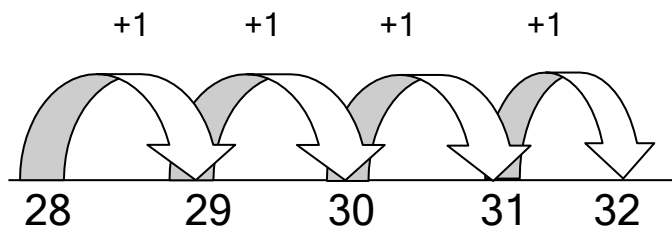
Count up from the smallest number to the largest to find the difference.

$$12 - 8 = 4$$



'The difference between 8 and 12 is 4.'

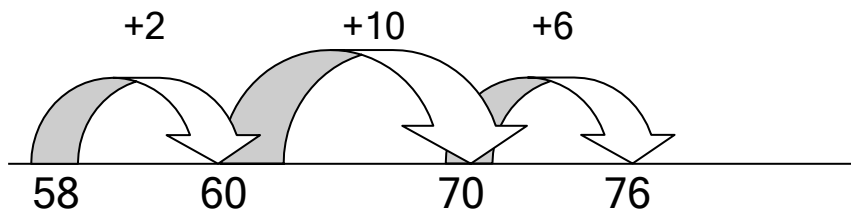
$$32 - 28 = 4$$



'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.

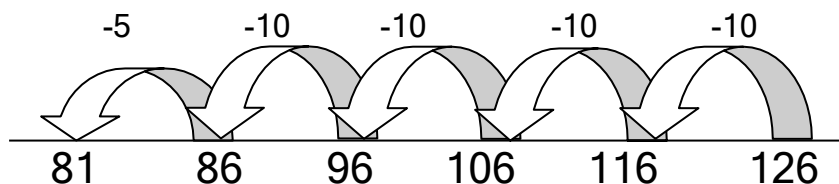
Subtraction - Year Three

- Y 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.

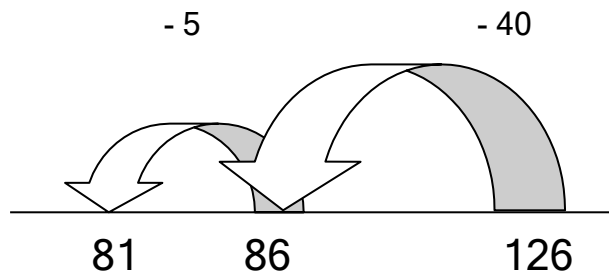
Further develop the use of the empty number line with calculations that bridge 100:

$$126 - 45 = 81$$



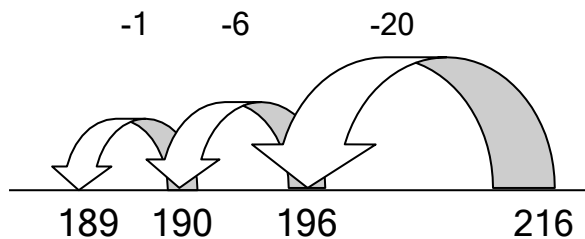
Use a 200 grid to support counting back in tens and bridging 100

Then use more efficient jumps:



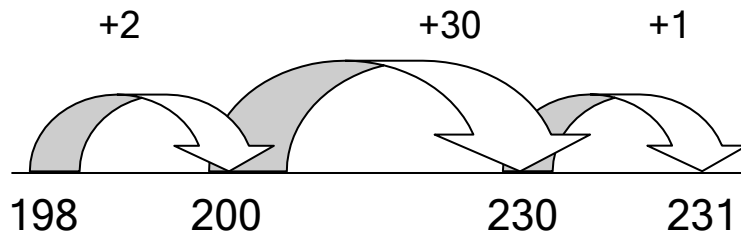
Extend with larger numbers by counting back...

$$216 - 27 = 189$$



...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:

$$78 - 23 = 55$$

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

'Partition numbers into tens and ones. 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.

$$\begin{array}{l} 70 \text{ and } 8 \\ - \underline{20 \text{ and } 3} \\ 50 \text{ and } 5 = 55 \end{array}$$

This will lead into the formal written method:

$$\begin{array}{r} 78 \\ - 23 \\ \hline 55 \end{array}$$

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:

$$73 - 27 = 46$$

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

73 is partitioned into 60 and 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:

$$73 - 27 = 46$$

$$\begin{array}{r}
 60 \quad 13 \\
 \cancel{70} \quad \cancel{3} \\
 - \underline{20} \quad \underline{7} \\
 40 \quad 6
 \end{array}
 \quad
 \begin{array}{r}
 6 \quad 13 \\
 \cancel{7} \quad \cancel{3} \\
 - \underline{2} \quad \underline{7} \\
 4 \quad 6
 \end{array}
 \quad
 \begin{array}{r}
 6 \quad 13 \\
 \cancel{7} \quad \cancel{3} \\
 - \underline{2} \quad \underline{7} \\
 4 \quad 6
 \end{array}$$

These three examples show a progression of methods to ensure a good understanding.

Continue to use the language of place value

'If we subtract seven from three we will get a negative number, so we need to exchange a ten for ten ones to give us 60 and 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 (see above).

$$235 - 127 = 108$$

$$\begin{array}{r}
 2 \quad 15 \\
 2 \quad \cancel{3} \quad \cancel{5} \\
 - \underline{1} \quad \underline{2} \quad \underline{7} \\
 1 \quad 0 \quad 8
 \end{array}$$

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

Y Subtract numbers with up to four 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.

$$258 - 73 = 185$$

$$\begin{array}{r} 200 \text{ and } 50 \text{ and } 8 \\ - \quad \quad \quad 70 \text{ and } 3 \\ \hline \end{array} \quad \text{becomes} \quad \begin{array}{r} 100 \text{ and } 150 \text{ and } 8 \\ - \quad \quad \quad 70 \text{ and } 3 \\ \hline 100 \text{ and } 80 \text{ and } 5 = 185 \end{array}$$

The 'and' may be replaced with a '+' sign, however this may cause confusion when subtracting. Children will need to practise partitioning in a variety of ways.

This leads to the formal written method, involving decomposition...

$$\begin{array}{r} 1 \quad 15 \\ 2 \quad 5 \quad 8 \\ - \quad 7 \quad 3 \\ \hline 1 \quad 7 \quad 5 \end{array}$$

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:

$$637 - 252 = 385$$

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

$$\begin{array}{r} 600 \text{ and } 30 \text{ and } 7 \\ - \quad 200 \text{ and } 50 \text{ and } 2 \\ \hline \end{array} \quad \begin{array}{r} 500 \text{ and } 130 \text{ and } 7 \\ - \quad 200 \text{ and } 50 \text{ and } 2 \\ \hline 300 \text{ and } 80 \text{ and } 5 \end{array} = 385$$

The 'and' may be replaced with a '+' sign, however this may cause confusion when subtracting.

This leads to a formal written method:

$$\begin{array}{r} 5 \quad 13 \\ 637 \\ - 252 \\ \hline 385 \end{array}$$

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).

$$3625 - 1219 = 2406$$

$$£36.25 - £12.19 = £24.06$$

$$\begin{array}{r} 1 \quad 15 \\ 3625 \\ - 1219 \\ \hline 2406 \end{array}$$

$$\begin{array}{r} 15 \\ 36.25 \\ - 12.19 \\ \hline 24.06 \end{array}$$

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

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

$$12,731 - 1,367 = 11,364$$

$$\begin{array}{r} ^6 ^{12} ^{11} \\ 12731 \\ - \underline{1367} \\ 11364 \end{array}$$

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.

$$£166.25 - £83.72 = £82.53$$

$$\begin{array}{r} ^{16} ^5 ^{12} \\ 166.25 \\ - \underline{83.72} \\ 82.53 \end{array}$$

Ensure the decimal points line up.

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

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 practise 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 and are able to 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

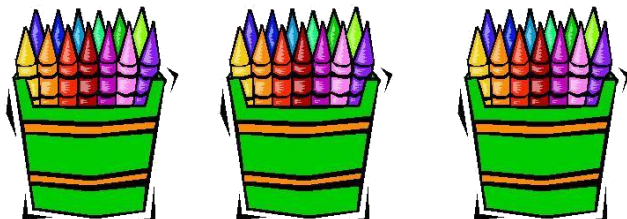
Y Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

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

Children will count repeated groups of the same size in practical contexts and use the appropriate 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.

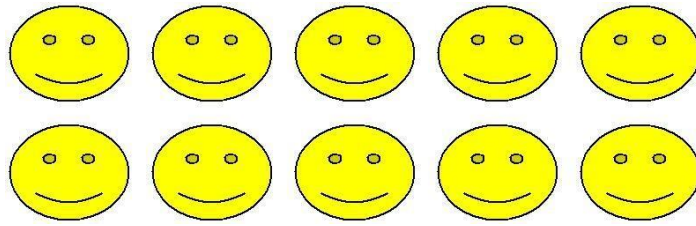


'Six pairs of socks.
How many socks altogether? 2, 4, 6, 8, 10, 12'

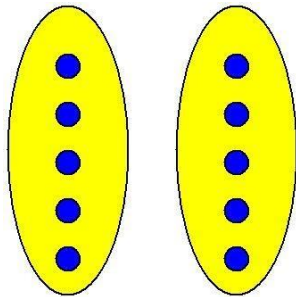


'Three pots of ten crayons. How many crayons altogether? 10, 20, 30'

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.

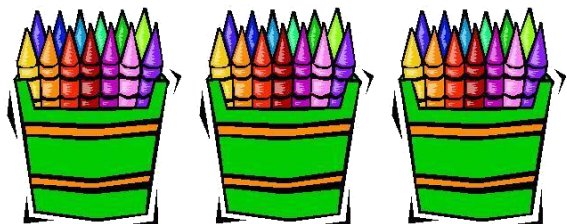
Multiplication - Year Two

- Y Recall and use multiplication facts for the 2, 5 and 10 multiplication tables
- Y Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (\times) and equals (=) signs
- Y solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts
- Y 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):



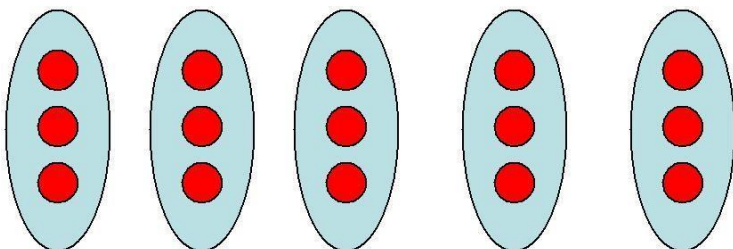
'3 groups of 10 crayons'

'How many crayons altogether?'

' $10 + 10 + 10 = 30$ '

'3 groups of 10' '3 times ten'

' $3 \times 10 = 30$ ' ' $10 \times 3 = 30$ '

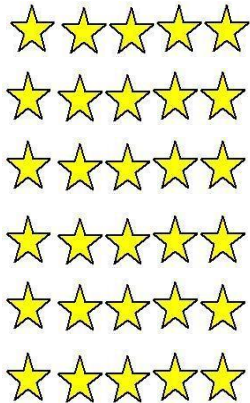


'5 groups of 3' '5 lots of 3' ' $3 + 3 + 3 + 3 + 3 = 15$ '

'5 times 3' '3 multiplied by 5' ' $5 \times 3 = 15$ ' ' $3 \times 5 = 15$ '

Using arrays to support multiplication:

$$6 \times 5 = 30$$



$$'5 + 5 + 5 + 5 + 5 + 5 = 30'$$

'6 rows of 5'

'6 groups of 5'

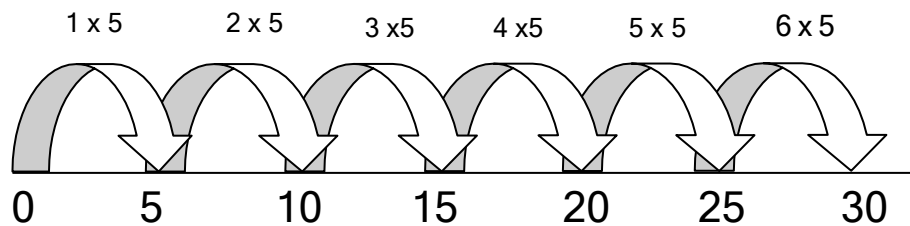
'5 groups of 6'

$$'5 \times 6 = 30'$$

$$'6 \times 5 = 30'$$

Using an empty number line:

$$6 \times 5 = 30$$



Make the link to repeated addition.

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

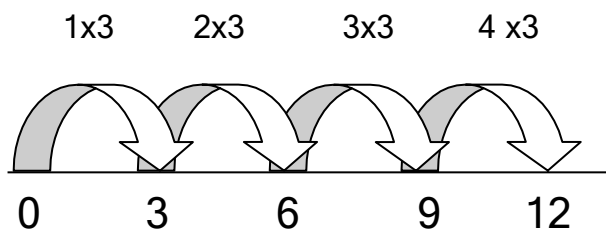
Multiplication - Year Three

- γ Recall and use multiplication facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables)
- γ 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).

$$4 \times 3 = 12$$



Array e.g.



'4 + 4 + 4'

'3 + 3 + 3 + 3'

Continue to link repeated addition and multiplication.

Partitioning method for multiplication of a "teen" number by a one-digit number:

$$13 \times 5 = 65 \text{ (Partition 13 into } 10 + 3 \text{)}$$

$$10 \times 5 = 50$$

$$3 \times 5 = 15$$

$$50 + 15 = 65$$

Develop the recording in preparation for formal short multiplication:

$$13 \times 8 = 104$$

$$\begin{array}{r} 13 \\ \times 8 \\ \hline 24 \text{ (} 8 \times 3 \text{)} \\ + 80 \text{ (} 8 \times 10 \text{)} \\ \hline 104 \end{array}$$

Use the language of place value to ensure understanding.

Include an addition symbol when adding partial products.

Model the same calculation using a number line, if necessary, to ensure understanding.

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

Once children are confident progress to multiplying other two-digit numbers by a one-digit number.

$$\begin{array}{r} 23 \\ \times 4 \\ \hline 12 \text{ (} 4 \times 3 \text{)} \\ + 80 \text{ (} 4 \times 20 \text{)} \\ \hline 92 \end{array}$$

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

Multiplication- Year Four

- γ Recall multiplication facts for multiplication tables up to 12×12
- γ 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.

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

$$36 \times 4 = 144$$

X	30	6
4	120	24

$$120 + 24 = 144 \text{ (add the two partial products)}$$

Develop the recording in preparation for formal short multiplication:

$$36 \times 4 = 144$$

$$\begin{array}{r} 36 \\ \times 4 \\ \hline 24 \quad (4 \times 6) \\ + 120 \quad (4 \times 30) \\ \hline 144 \end{array}$$

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

$$36 \times 4 = 144$$

$$\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \end{array}$$

Use the language of place value to ensure understanding.

Ensure that the digit which is 'exchanged' is written above 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 and/or expanded method first:

$$127 \times 6 = 762$$

X	100	20	7
6	600	120	42

$$600 + 120 + 42 = 762 \text{ (add the three partial products)}$$

This will lead into short multiplication (formal method):

$$\begin{array}{r} 127 \\ \times 146 \\ \hline 762 \end{array}$$

Use the language of place value to ensure understanding.

Ensure that the digits which are 'exchanged' are written above 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

Y Multiply numbers up to four 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.

When children are confident introduce multiplication by a two-digit number.

Compact long multiplication (formal method):

$$23 \times 13 = 299$$

$$\begin{array}{r} 23 \\ \times 13 \\ \hline 69 \quad (3 \times 3, 3 \times 20) \\ + 230 \quad (10 \times 3, 10 \times 20) \\ \hline 299 \end{array}$$

Use the language of place value to ensure understanding.

Add the two partial products.

Continue to practise the formal method of long multiplication of a two-digit number by a two-digit number:

$$56 \times 27 = 1512$$

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 392 \quad (7 \times 6, 7 \times 50) \\ + 1120 \quad (20 \times 6, 20 \times 50) \\ \hline 1512 \end{array}$$

In this example there are digits that have been 'exchanged' over in the partial products.

Use the language of place value to ensure understanding.

Add the partial products.

When children are confident, extend with three-digit numbers multiplied by a two-digit number:

$$124 \times 26 = 3224$$

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \quad (6 \times 4, 6 \times 20, 6 \times 100) \\ + 2480 \quad (20 \times 4, 20 \times 20, 20 \times 100) \\ \hline 3224 \end{array}$$

Use the language of place value to ensure understanding.

Add the two partial products.

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

Extend with long multiplication of decimal numbers (initially in the context of money and measures).

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

Multiplication - Year Six

Y Multiply multi-digit numbers (including decimals) up to four 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 long multiplication method with larger numbers and decimals throughout Y6.

The formal written method of long multiplication:

$$\begin{array}{r} 53.2 \\ \times 24.0 \\ \hline 212.8 \\ 1064.0 \\ \hline 1276.8 \end{array}$$

(53.2 x 4)
(53.2 x 20)

A zero has been included so that the correct place values can be maintained.

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, and for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

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.

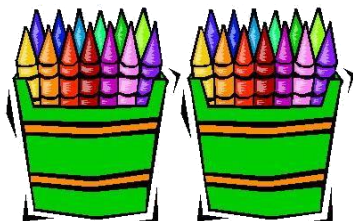
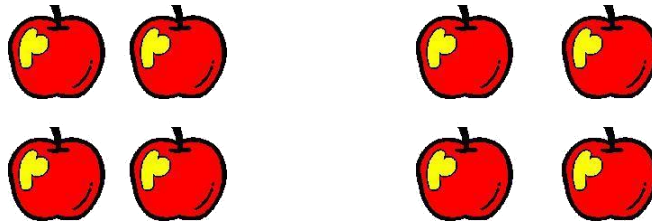
'Half of the apples for you and half of the apples for me.'

Division - Year One

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

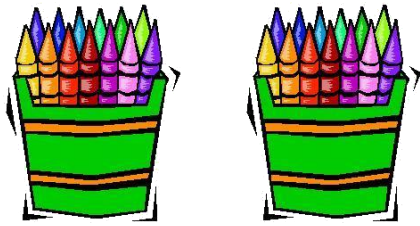
'Share these eight apples equally between two children. How many apples will each child have?'



'Share 20 crayons between 2 pots.'

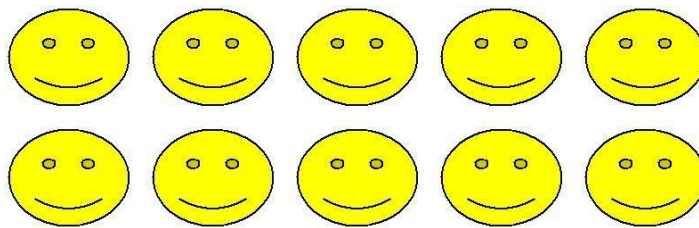
'How many crayons are in each pot?'

Children will move from sharing to grouping in a practical way

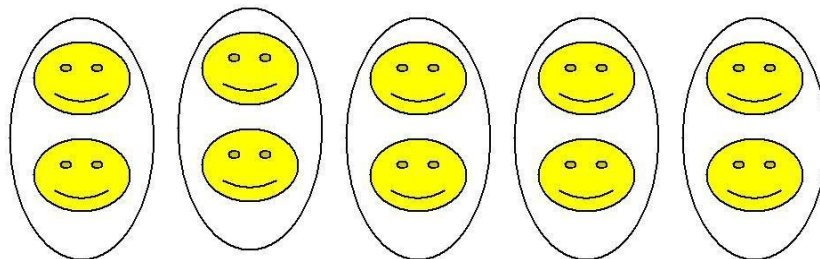


'Put 20 crayons into groups of 10. How many pots do we need?'

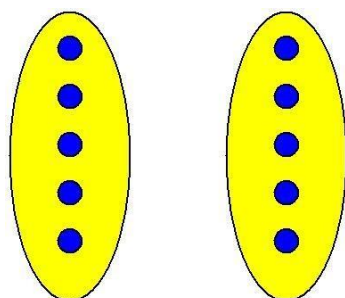
Use arrays to support early division



'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.

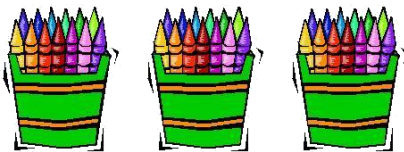
Division - Year Two

- γ Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables
- γ Calculate mathematical statements for division within the multiplication tables they know and write them using the division (\div) and equals (=) signs
- γ 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 \div sign to record, using multiples that they know.

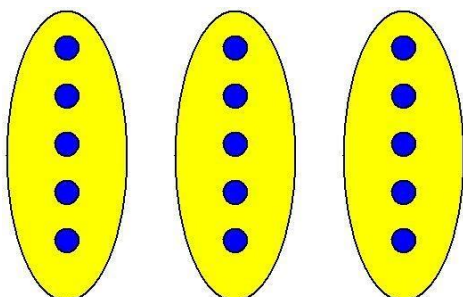
Sharing and grouping:



'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'

$$30 \div 10 = 3$$
$$30 \div 3 = 10$$



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

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

$$15 \div 5 = 3$$
$$15 \div 3 = 5$$

Using arrays to support division

$$15 \div 5 = 3$$

$$15 \div 3 = 5$$



How many groups of 3?

How many groups of 5?

15 shared between 3 people is...?

15 shared between 5 people is...?

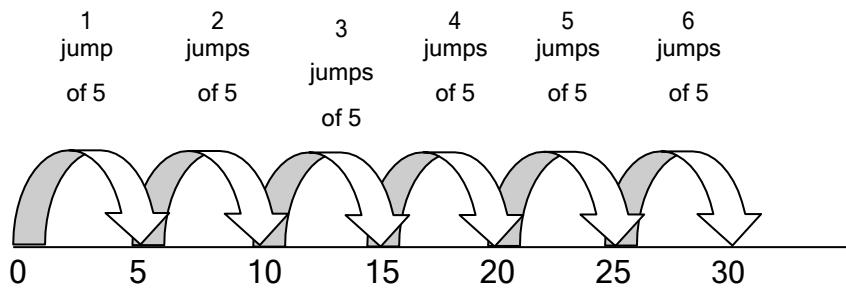
15 divided by 5 = 3

15 divided by 3 = 5

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

$$30 \div 5 = 6$$

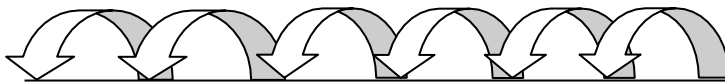
'How many jumps of five make thirty?'



Also jump back to make the link with repeated subtraction:

$$30 \div 5 = 6$$

'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

- Y 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)
- Y 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

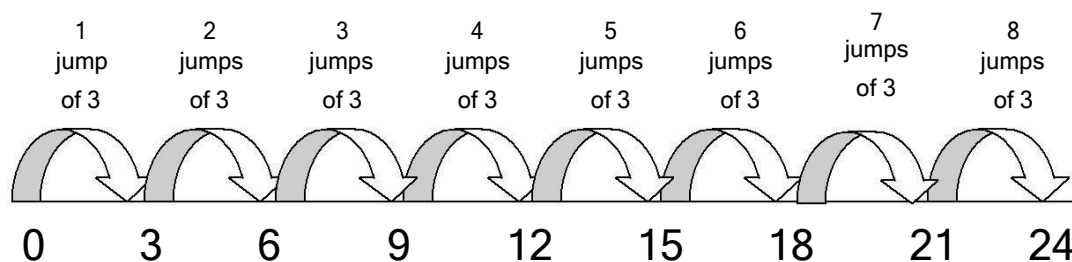
NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use practical resources, pictures, diagrams, number lines, arrays and the \div sign to record, using multiples that they know, as appropriate.

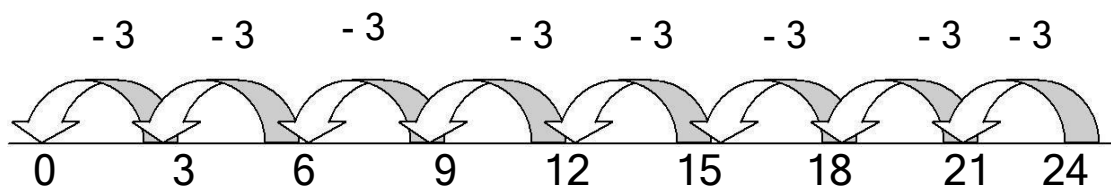
Using an empty number line to count forwards, if appropriate...

$$24 \div 3 = 8$$

'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...

$$\begin{array}{r} 8 \\ 3 \overline{) 24} \end{array}$$

'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

- γ Recall multiplication and division facts for multiplication tables up to 12×12
- γ Use place value, known and derived facts to divide mentally
- γ Divide two-digit and three-digit numbers by a one-digit number using formal written layout (not explicitly stated in the programmes of study but implied in the non-statutory guidance)

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.

$$32 \div 8 = 4$$

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

$$\begin{array}{r} 4 \\ \underline{8 \ 3} \ 2 \end{array}$$

'How many eights are there in thirty-two?'

Continue using the formal written layout, introducing remainders:

$$25 \div 3 = 8 \text{ r}1$$

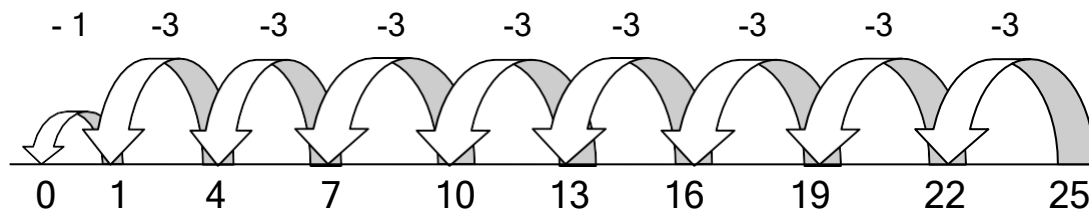
$$\begin{array}{r} 8 \text{ r} 1 \\ \underline{3 \ 2} \ 5 \end{array}$$

NB Remainders are not specifically referred to until Y5 in the National Curriculum.

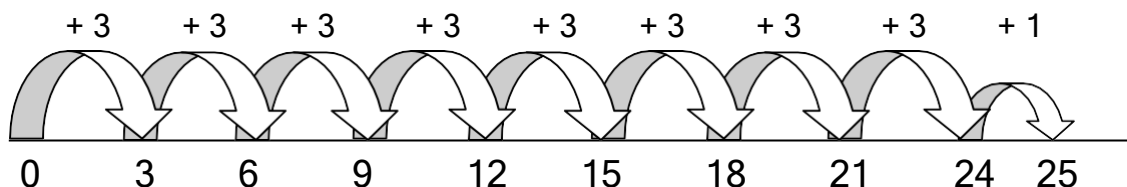
This could be modelled using an empty number line, if necessary:

'Eight jumps of three and one left over.'

$$25 \div 3 = 8 \text{ r}1$$



Alternatively, you could jump forwards in multiples of three from zero to twenty-four ('and one more makes 25')



Division using partitioning (two-digits divided by one-digit):

$$65 \div 5 = 13$$

$$65 = 50 + 15 \text{ Partition } 65 \text{ into } 50 \text{ and } 15$$

$$50 \div 5 = 10$$

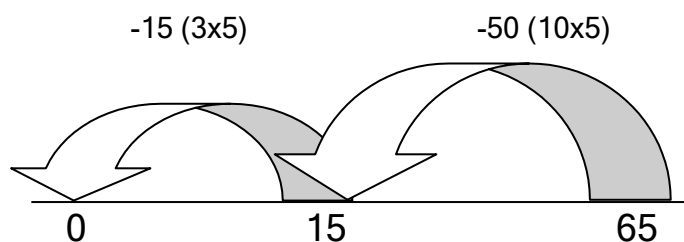
$$15 \div 5 = 3$$

$$10 + 3 = 13$$

NB Children will need to practise partitioning in a variety of ways.

Continue to use empty number lines, as appropriate, using multiples of the divisor:

$$65 \div 5 = 13$$



$$98 \div 7 = 14$$

$$98 = 70 + 28 \text{ (Partition 98 into 70 and 28)}$$

$$70 \div 7 = 10$$

$$28 \div 7 = 4$$

$$10 + 4 = 14$$

This could be modelled on an empty number line to further develop understanding.

NB Children will need to practise partitioning in a variety of ways.

This will introduce the children to a formal method of division.

$$98 \div 7 = 14$$

$$\begin{array}{r} \overline{7 \overline{) 98}} \\ \underline{70} \quad (10 \times 7) \\ 28 \\ \underline{28} \quad (4 \times 7) \\ 00 \end{array}$$

'Using our tables knowledge, we know that $10 \times 7 = 70$, therefore $70 \div 7 = 10$.

We also know that 98 can be partitioned into 70 and 28 ($98 = 70 + 28$).

Seven 'goes into' 70 ten times. 28 is left to divide by 7. $28 \div 7 = 4$.

Ten add four equals 14'

If children are confident develop further, by dividing three-digit numbers by a one-digit number.

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

Year Five - Division

- Y Divide numbers up to four 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...

$$184 \div 8 = 23$$

$$\begin{array}{r} 23 \\ 8 \overline{) 184} \end{array}$$

Use the language of place value to ensure understanding.

...and with remainders:

$$432 \div 5 = 86 \text{ r}2$$

$$\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{) 432} \end{array}$$

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.

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

Year Six - Division

- Y Divide numbers up to four digits by a two-digit number using the formal written method of **short division** where appropriate, interpreting remainders according to the context
- Y Divide numbers up to four 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.

$$496 \div 11 = 45 \text{ r}1$$

$$\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{) 496} \end{array}$$

The remainder can also be expressed as a fraction, $\frac{1}{11}$ (the remainder divided by the divisor)

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

$$\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{) 496} \\ - 440 \quad (40 \times 11) \\ \hline 56 \\ - 55 \quad (5 \times 11) \\ \hline 1 \quad (\text{remainder}) \end{array}$$

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: $45\frac{1}{11}$

Continue to extend this method by dividing the remainder, up to 2 decimal places.

$$257 \div 4 = 64.25$$

$$\begin{array}{r} 64.25 \\ 4 \overline{) 257.10} \end{array}$$

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):

$$144 \div 16 = 9$$

$$\begin{array}{r} 9 \\ 16 \overline{) 144} \\ \underline{- 64} \quad (4 \times 16) \\ 80 \\ \underline{- 64} \quad (4 \times 16) \\ 16 \\ \underline{- 16} \quad (1 \times 16) \\ 0 \end{array}$$

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:

$$432 \div 15 = 28 \text{ r}12$$

$$\begin{array}{r} 28 \text{ r} 12 \\ 15 \overline{) 432} \\ \underline{300} \quad (20 \times 15) \\ 132 \\ \underline{120} \quad (8 \times 15) \\ 12 \quad (\text{remainder}) \end{array}$$

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, $\frac{12}{15}$ (the remainder divided by the divisor) or as a decimal, 0.8 (see next example). 15

The answer is: $28 \frac{12}{15}$ or 28.8

This is an alternative way of recording formal long division:

$$432 \div 15 = 28.8$$

$$\begin{array}{r} 28.8 \\ \hline 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

NB Only teach this method when children are completely secure with the previous method.

The remainder is expressed as a decimal.

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 are able to use mental methods (with jottings) and use efficient formal written methods accurately and with confidence.