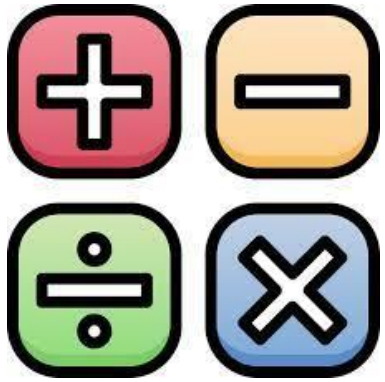


The Merton Primary School

Calculation policy

Contents

2023 / 24 Updates and introduction:

- **The calculation policy was reviewed by teaching staff in 2023-2024 as part of our ongoing reflection on appropriate calculation strategies, planning, differing resources including online and teaching & learning approaches in general.**
- This calculation policy is for **teachers, TAs**, **parents** and **children**, and is designed to be an accessible document allowing anyone reading it to be able to see the way we teach calculation for the four operations at The Merton Primary School, and the progression through year groups.
- This policy should be used in conjunction with our Maths policy and our one page summary:
- The National Curriculum (2013) continues to be the key document which outlines the objectives that children should learn in each year group.

The national curriculum in England - Framework document (publishing.service.gov.uk)

- Where this policy refers to objectives, these are any related to calculation within the National Curriculum. **Some may have been reworded for clarity.**

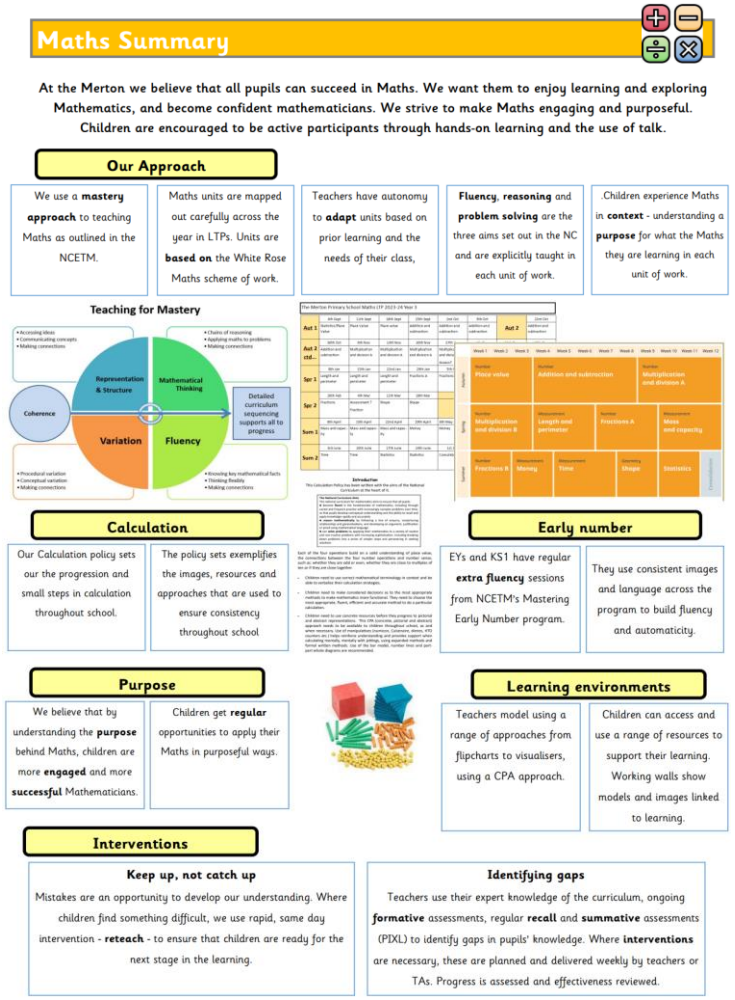
The National Curriculum for mathematics aims to ensure that all pupils:

♣ become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

♣ can **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.

♣ can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

- Each of the four operations build on a solid understanding of place value, the connections between the four number operations and number sense, such as: whether they are odd or even, whether they are close to multiples of ten or if they are close together.

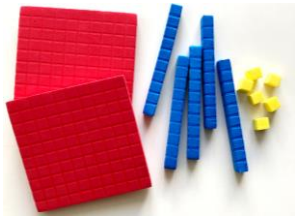
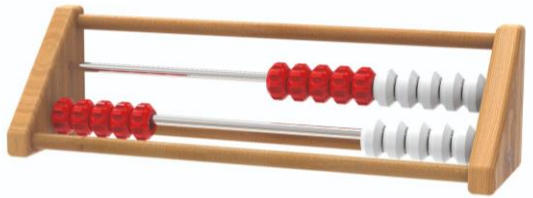


Return to Contents page

2023 / 24 Updates and introduction:

- Children need to use correct mathematical terminology in context and be able to verbalise their calculation strategies.
- Children need to make considered decisions as to the most appropriate methods to make mathematics more functional. They need to choose the most appropriate, fluent, efficient and accurate method to do a particular calculation.
- Children need to use concrete resources before they progress to pictorial and abstract representations. The CPA (concrete, pictorial and abstract) approach needs to be available to children throughout school, as and when necessary.
- Use of manipulatives (Numicon, Cuisenaire, Dienes/Base 10, Rekenrek, HTO counters etc.) helps reinforce understanding and provides support when calculating mentally, mentally with jottings, using expanded methods and formal written methods. Use of the bar model, number lines and part-whole diagrams are recommended and exemplified throughout the policy.




- Children should progress between the stages working towards formal written methods (where appropriate), once they have mastered each stage. However, they should not be hurried and, after the method has been taught, children should still be able to make their preferred choice of the most appropriate, efficient and accurate method for them. Previous stages may need to be revisited to consolidate understanding when introducing a new strategy.
- As new methods of calculations are introduced, children should have the opportunity to examine them, alongside the method they have consolidated, to make connections between the methods and establish similarities and differences.
- This policy includes sections on: Addition, Subtraction, Multiplication and Division. It outlines progression in teaching, from mental through to formal written methods.
- **This policy acts as a guide to ensure consistent, clear, progression throughout school and across year groups, however it does not include all small steps used by teachers to support children's learning.**

Return to Contents page

Addition

Models and images

- Number tracks and lines
- Bead strings
- Part whole models
- Rekenrek
- Dienes / Base 10
- Place value counters
- Place value (arrow) cards
- Ten frames
- Numicon
- Cuisenaire
- Counting sticks
- Hundred squares
- Bar model
- IT resources e.g. White Rose, Topmarks, ITPs

Key vocabulary

Add	Sum
Addition	Altogether
Plus	Increase
And	More
Count on	Count all
Total	Inverse
Commutative	Associative

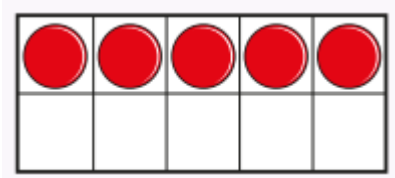
Return to Contents page

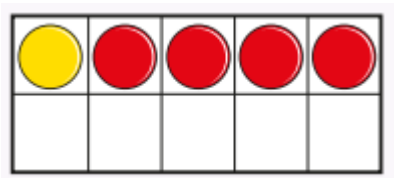
Year 1 Addition Objectives

- **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 (e.g. 6 + __ = 10)**

Mental Strategies

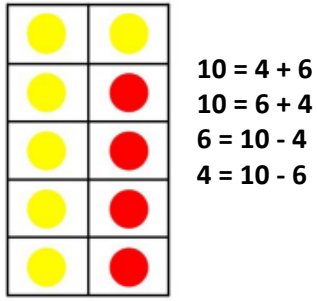
- Show how the commutative law can be used to reorder numbers when adding e.g. put the larger number first: **2+7 = 7 + 2**
- Count on in ones: **5 + 2 = 5 + 1 + 1**
- Use number tracks / lines / Rekenrek to practise counting on from any number: **"Put 5 in your head and count on 4"**
- Use number facts knowledge: **7 = 7 + 0** or **6 + 1 or 5 + 2 etc**
- Use number bonds to 10 or 20: **5 + 5, 7 + 3, 15 + 5, 17 + 3 etc**
- Use ten frames to support mental calculations: **5 = 5 + 0, 4 + 1 etc**





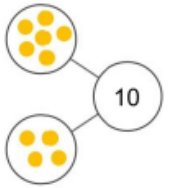
Written Strategies

- Begin to represent the models and images they are using as number sentences using the correct symbols.
- Children should see the calculations alongside the equipment and images as part of an embedded CPA approach.



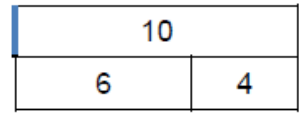
10 = 4 + 6
10 = 6 + 4
6 = 10 - 4
4 = 10 - 6

Tens Frame



6 + 4 = 10
4 + 6 = 10
10 – 4 = 6
10 – 6 = 4

Part Whole Model



6 + 4 = 10
4 + 6 = 10
10 – 4 = 6
10 – 6 = 4

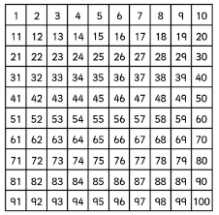
Bar Model

Return to Contents page

Year 2 Addition Objectives

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.**



Mental Strategies

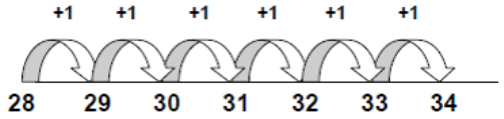
- Use knowledge of place value to say 1 more and 10 more than any 2 digit number. Use a hundred square alongside this to scaffold.
- Develop this strategy to count on in tens when adding multiples of 10: **76 + 20 as 76 + 10 + 10** saying **76. 86. 96.**
- Partition using place value: **57 + 32** becomes **50 + 30** and **7 + 2**
- Compensation: **45 + 9** becomes **45 + 10 – 1**

  56 + 11 becomes **56 + 10 + 1**
- Using known facts patterns: **6 + 3 = 9** so **26 + 3 = 29** and **76 + 3 = 79**
- Use partitioning to bridge through a ten: **57 + 5** becomes **57 + 3 + 2**
- Use pairs of numbers that make ten when adding 3 single digit numbers: **6 + 7 + 4** becomes **10 + 7**

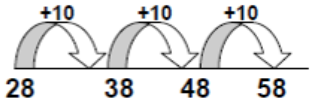
Written Strategies

- Count on in ones and tens using number lines / number tracks:

28 + 6 = 34

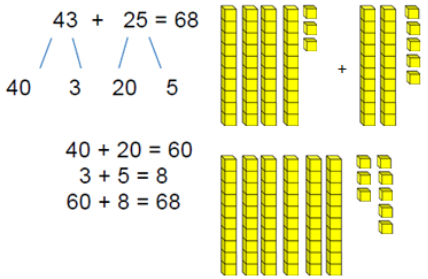


28 + 30 = 58



- Partition into tens and ones when adding:

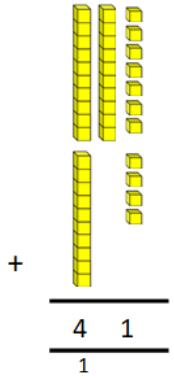
Partition the numbers into tens and ones.
Add the ones together and then add the tens together.
Recombine to give the total.



This method could be demonstrated with equipment such as Base ten (see left), place value counters etc.

Children should progress to drawing jottings of this method.

- Demonstrate exchanges (where the ones are 10 or more) using the same approach.
- Model these calculations in a column layout: **27 + 14**



Return to Contents page

Year 3 Addition Objectives

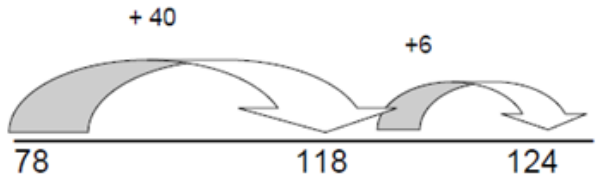
Add and subtract numbers mentally, including:

- **a three-digit number and ones;**
- **a three-digit number and tens;**
- **a three-digit number and hundreds.**
- **Add numbers with up to three digits, using formal written method of columnar addition, where appropriate.**

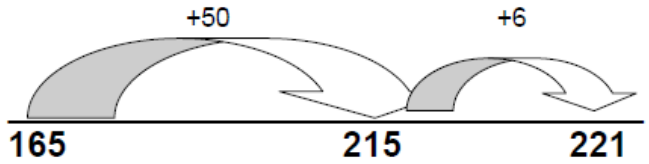
Mental Strategies

- Using place value to partition and count on / add ones, tens and hundreds.
- Use part whole models, bar models & number lines to support visualisations.

e.g. 78 + 46 = 124



165 + 56 = 221



*These examples may be broken into jumps of ten prior to doing a jump of 40.

Written Strategies

- Use place value knowledge and partitioning to add numbers:

85 + 37 = 80 + 5 + 30 + 7

5 + 7 = 12

80 + 30 = 110

110 + 12 = 122

85 + 37 = 122

- Use an expanded method to support understanding of the column method:

6 3		**6 8**	
+ 3 2		**+ 2 4**	
5	**(3 + 2)**	**1 2**	**(8 + 4)**
9 0	**(60 + 30)**	**8 0**	**(60 + 20)**
9 5		**9 2**	

- Use the compact method with exchanges shown underneath.

6 3	**6 8**
+ 3 2	**+ 2 4**
9 5	**9 2**
	1

- Children use the column method in the context of money, being introduced to the decimal place to show pence.
- Written methods should be supported through a CPA approach e.g. with the use of Base 10 equipment and images alongside.

Return to Contents page

Year 4 Addition Objectives

Add and subtract numbers mentally, including:

- **a four-digit number and ones;**
- **a four-digit number and tens;**
- **a four-digit number and hundreds;**
- **a four-digit number and thousands.**
- **Add and subtract numbers with up to 4 digits, using formal written method of columnar addition, where appropriate.**

Mental Strategies

- Using place value to partition and count on / add ones, tens and hundreds.

e.g. **341 + 217 =**

1 + 7 = 8

40 + 10 = 50

300 + 200 = 500

Combine to find the total: 558

- Use number lines to support visualisations.

Written Strategies

- Further develop the use of the column method with exchanges shown underneath:

```
  613        618
+ 332      + 423
  945      1041
             1  1
```

- Use the language of place value to ensure understanding:

E.g. above: 8 ones plus 3 ones is 11 ones.

10 ones exchange to 1 ten. Write it below the tens column.

1 ten plus 2 tens, plus the exchanged ten gives us 4 tens.

6 hundreds plus 4 hundreds is 10 hundreds, which exchange to make 1 thousand.

We write 0 in the hundreds and 1 in the thousands.

- Written methods should continue to be supported through a CPA approach e.g. with the use of Base 10 equipment and images alongside.

Return to Contents page

Year 5 / 6 Addition Objectives

- **Add and subtract numbers mentally, with increasingly large numbers.**
- **Add whole numbers with more than 4 digits, including using formal written method (column addition).**
- **Perform mental calculations, including with mixed operations and large numbers.**

Mental Strategies

- Using place value to partition and count on, including decimals.

e.g. **5.42 + 1.23 =**
0.42 + 0.23 = 0.65
5 + 1 = 6
Combine to make 6.65

- Using estimating and rounding strategies.

e.g. **5332 + 6713 rounded to nearest hundreds:**
5300 + 6700 = 12000
Add the rest: 32 + 13 = 45
Combine to make 12045

Written Strategies

- Use the formal written method for the addition of larger numbers, including those with decimal places.

```
  618.32
+ 423.29
 1041.61
  1  1  1
```

Ensure that decimal points line up in the column.

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

E.g. above: 2 hundredths add 9 hundredths is 11 hundredths.

10 hundredths exchange to 1 tenth. Write it below the tenths.

3 tenths plus 2 tenths, plus the exchanged tenth gives us 6 tenths.

8 ones plus 3 ones is 11 ones…

…and so on (see Y4 example)

Children are expected to use mental methods (with jottings) when appropriate, but for other calculations, they should use an efficient, formal written method accurately and with confidence.

Return to Contents page

Subtraction

Models and images

- Number tracks and lines
- Bead strings
- Part whole models
- Rekenrek
- Dienes / Base 10
- Place value counters
- Place value (arrow) cards
- Ten frames
- Numicon
- Cuisenaire
- Counting sticks
- Hundred squares
- Bar model
- IT resources e.g. White Rose, Topmarks, ITPs

Key vocabulary

Subtract	Less than
Take away	Fewer than
Take from	Decrease by
Distance between	Deduct
Difference	Reduce
Count back/on	Minus
Inverse	Exchange

Children need to know that subtraction is not commutative or associative.

Return to Contents page

Year 1 Subtraction Objectives

- **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 e.g. 7 = ☐ - 9**

Mental Strategies

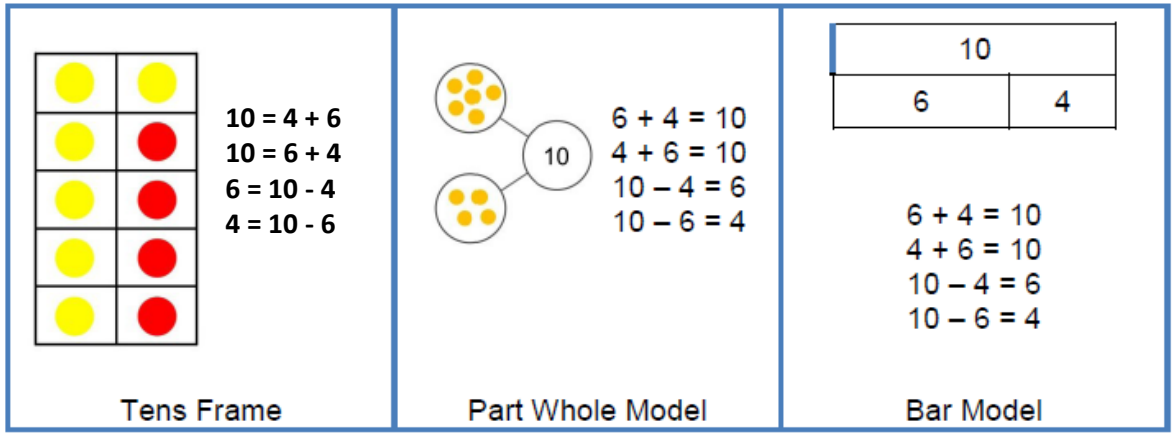
- Children will practise counting back from any number: 'Put seven in your head and count back two.'
- Use number tracks and lines, Rekenrek or bead strings to count back for subtraction, counting back from the largest number.
- Progress from marked number lines, to those that are blank.
- Use number bond facts to 10 and 20: **10 – 5 = 5** **7 = 10 - 3** **15 = 20 - 5**
- Use concrete and pictorial representations to solve missing number problems:

17 - ☐ = 4

- Use the inverse of addition to help with subtraction

Written Strategies

- Begin to represent the models and images they are using as number sentences using the correct symbols.
- Children should see the calculations alongside the equipment and images as part of an embedded CPA approach.



Return to Contents page

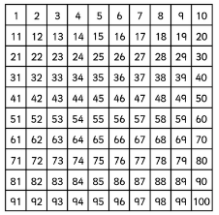
Year 2 Subtraction Objectives

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

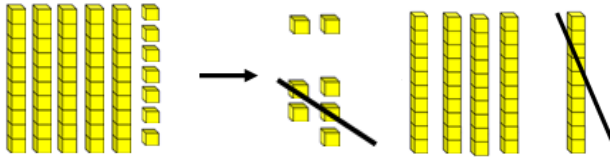
- **a two digit number subtract ones;**
- **a two digit number subtract tens;**
- **two-digit numbers subtract two-digit.**

Mental Strategies

- Use place value and say 1 less and 10 less than any two digit number.
- Use place value to partition:



e.g. **57-15** → **7-5 = 2 , 50-10 = 40 combine 40 + 2 = 42**



- Use place value to partition then adjust:

e.g. **45 - 9 becomes 45 - 10 = 35 then 35 + 1 = 36**

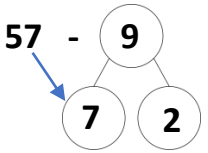
45 - 21 becomes 45 - 20 = 25 then 25 - 1 = 24

- Count back in multiples of 10: **76 - 20 is 76 - 10 - 10 saying 76, 66, 56**

e.g. using hundred squares / base ten / number lines

- Use patterns of known facts: **6 - 3 = 3, so 36 - 3 = 33 and 76 - 3 = 73**
- Count forwards to find the difference where appropriate.
- Use known facts to bridge through 10: **57 - 9 as 57 - 7 - 2 = 48**

e.g.



The part whole model shows how we can partition 9 into 7 and 2 to easily get to 50 then subtract the final amount.

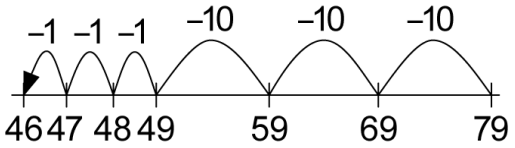
then 50 – 2 = 48

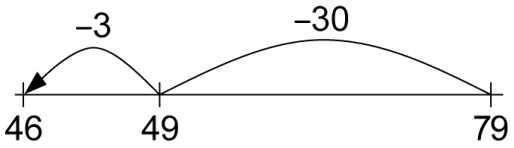
Written Strategies

Written methods should be supported through a CPA approach e.g. with the use of Base 10 equipment and images alongside.

- Use empty number lines to count back in ones and tens. These jumps can become more efficient as children become more confident.

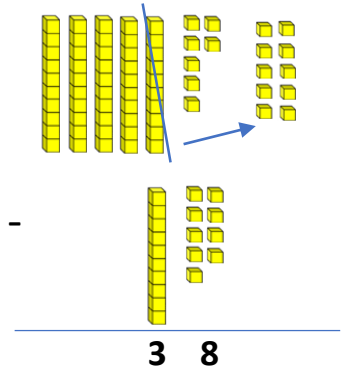
e.g. 79 - 33





- Partition the numbers into tens and ones. Subtract the ones first and then subtract the tens. Calculations are laid out in columns.
- Move on to calculations that bridge the tens. Introduce exchange through the use of Base 10 / place value counters.

e.g. **57 – 19 =**



Return to Contents page

Year 3 Subtraction Objectives

Subtract numbers mentally, including:

- **a three-digit number subtract ones;**
- **a three-digit number subtract tens;**
- **a three-digit number subtract hundreds.**
- **Subtract numbers with up to three digits, using formal written method of columnar subtraction, where appropriate.**

Mental Strategies

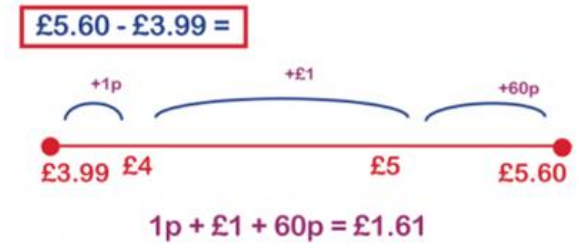
- Using place value to partition and subtract ones, tens and hundreds.
- Use number lines to support visualisations.
- Use known facts and patterns to support strategies.

e.g.	**8 – 3 = 5**	**28 – 3 = 25**
so	**80 – 30 = 50**	**128 – 3 = 125**
and	**800 – 300 = 50**	**178 – 3 = 175**

- Find the difference by counting on where appropriate:

e.g. **345 – 338 = 7**

Count on from 338 to 345 either in ones or by jumping to 340 first.



Written Strategies

- As with addition, the expanded method can be used to demonstrate what is happening in the column method, however this is not used by children.
- Children use a compact formal method, subtracting ones, then tens.

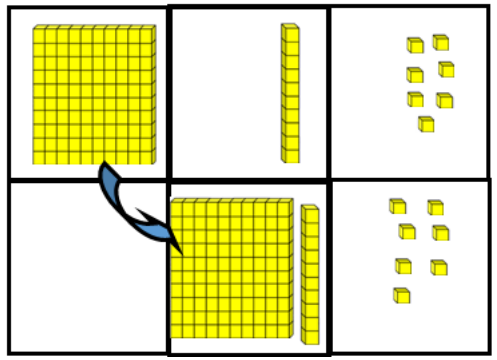
```
  6 3
- 3 2
  3 1
```

Where there is no exchange, children will progress quickly with this method.

- Where there are exchanges, children will use the formal method to exchange across columns, alongside concrete resources and pictures which will help them to see what is happening in the calculation:

e.g. **117 – 45:**

```
  0 1 1 7
-   4 5
  -------
    7 2
  -------
```



- Children use the column method in the context of money, being introduced to the decimal place to show pence.
- Written methods should be supported through a CPA approach e.g. with the use of Base 10 equipment and images alongside.

Return to Contents page

Year 4 Subtraction Objectives

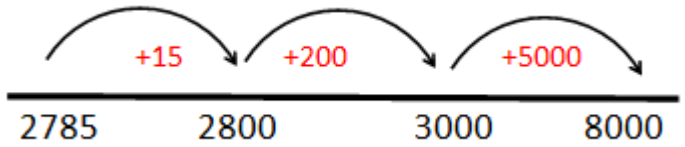
Subtract numbers mentally, including:

- **a four-digit number subtract ones;**
- **a four-digit number subtract tens;**
- **a four-digit number subtract hundreds;**
- **a four-digit number subtract thousands.**
- **Subtract numbers with up to 4 digits, using formal written method of columnar addition, where appropriate.**

Mental Strategies

- Using place value to partition and subtract ones, tens, hundreds and thousands.
- Use known facts and patterns to support strategies.
- Use number lines to support visualisations.
- Find the difference by counting on where appropriate:

e.g. **8000 – 2785 =**



Count on to the next multiple of a hundred, then a thousand and so on.

Written Strategies

- Further develop the formal method of subtraction with 3 and 4 digit numbers.

```
  653
- 332
  321
```

```
  3 6 11 8
- 2 4 8 3
  1 1 3 5
```

(5 above the 6)

- Use the language of place value to ensure understanding:

E.g. above: 8 ones subtract 3 ones is 5 ones.

1 ten subtract 8 tens needs an exchange.
Exchange 1 hundred to become 10 tens.
Now we have 11 tens and can subtract 8 tens to get 3 tens.

We now have 5 hundreds.
5 hundreds subtract 4 hundreds is 1 hundred.

3 thousands subtract 2 thousands is 1 thousand.

- Written methods should be supported through a CPA approach e.g. with the use of Base 10 equipment and images alongside.

Return to Contents page

Year 5/6 Subtraction Objectives

- **Subtract numbers mentally, with increasingly large numbers.**
- **Subtract whole numbers with more than 4 digits, including using formal written method (column subtraction).**
- **Perform mental calculations, including with mixed operations and large numbers.**

Mental Strategies

- Using place value to partition and subtract ones, tens, hundreds, thousands and further up to millions.
- Use place value to partition decimals.
- Use known facts and patterns to support strategies.
- Use number lines to support visualisations.
- Use estimating and rounding strategies.
- Find the difference by counting on where appropriate.

Written Strategies

- Further develop the formal method of subtraction with numbers up to 1 million.
- Use the formal column method of subtraction with decimals.

e.g. 725.75 - 233.82 = 491.93

$$\begin{array}{r} {}^{6}\not{7}\,{}_{1}2{}^{4}\not{5}\cdot{}_{1}75 \\ -\ 233\cdot 82 \\ \hline 491.93 \end{array}$$

- Use the language of place value to ensure understanding:

E.g. above: 5 hundredths subtract 2 hundredths is 3 hundredths.

7 tenths subtract 8 tenths needs an exchange. Exchange 1 one to 10 tenths. We now have 17 tenths and can subtract 8 tenths to give 9 tenths.

We now have 4 ones. 4 ones subtract 3 ones is 1 one.

and so on with tens and hundreds… (See Y4 example)

Children are expected to use mental methods (with jottings) when appropriate, but for other calculations, they should use an efficient, formal written method accurately and with confidence.

Return to Contents page

Multiplication

Models and images

- Number tracks and lines
- Bead strings
- Part whole models
- Rekenrek
- Dienes / Base 10
- Place value counters
- Ten frames
- Numicon
- Cuisenaire
- Counting sticks
- Hundred squares
- Bar model
- IT resources e.g. White Rose, Topmarks, ITPs

Key vocabulary

Multiply	Multiplication
Times	Lots of
Groups of	Sets of
Product	Multiple
Double	Factors
Repeated addition	Commutative
Distributive	Associative

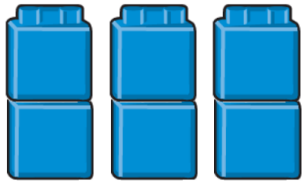
Return to Contents page

Year 1 Multiplication Objectives

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

Mental Strategies

- Make equal groups e.g. make towers of cubes or groups of toys:

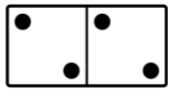


- Understand multiplication as repeated addition.
- Count repeated groups of the same size in practical contexts:

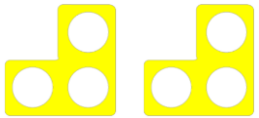
2 groups of 10 = 20 10 + 10 = 20 Double 10 is 20. 10 groups of 2 = 20 2+2+2+2+2+2+2+2+2+2=20	Three groups of five. How many altogether? 5, 10, 15	2 + 2 + 2 = 6 3 + 3 = 6 2 rows of 3 = 6 3 rows of 2 = 6

- Children count in 2s, 5s and 10s using a variety of concrete resources and contexts.

- Children use concrete resources and pictorial representations to calculate doubles for numbers 1-10.



Double 2 is 4 **2 + 2 = 4** **4 = 2 + 2**



Double 3 is 6 **3 + 3 = 6** **6 = 3 + 3**

Written Strategies

- Pupils will explore different ways of recording their jottings and pictorial representations.
- There are no formal written method requirements for multiplication in Year 1.

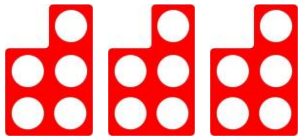
Return to Contents page

Year 2 Multiplication Objectives

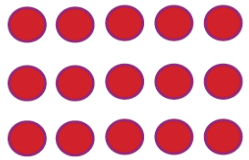
- **Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.**
- **Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.**
- **Show that the multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.**
- **Solve problems involving multiplication and division, including problems in context**.

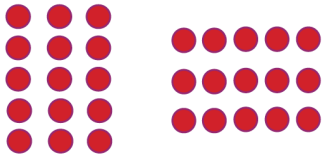
Mental Strategies

- Count in 2s, 3s, 5s and 10s using concrete resources and pictorial representation.



- Explore, make and describe arrays to support multiplication:



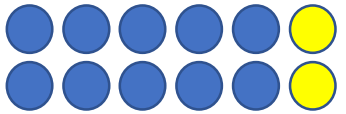


6 + 6 = 12 2 x 6 = 12 2+2+2+2+2+2=12 6 x 2 = 12

3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 5 + 5 + 5 = 15 3 x 5 = 15

- Rotate arrays to show that multiplication of two numbers can be done in any order **(commutative law)**

- Use arrays to support with calculating unknown facts from known by partitioning numbers:



e.g. **6 x 2 = 5 x 2 + 1 x 2**

6 x 2 = 10 + 2 = 12

- Understand multiplication as repeated addition :

e.g. **3 x 10 = 10 + 10 + 10 = 30**

- Children use the language of 'groups of' and 'lots of' to understand multiplication:

e.g. **3 x 10 means 3 lots of 10. We can count three 10s : 10, 20, 30**

4 x 5 means 4 lots of 5. We can count four 5s : 5, 10, 15, 20

Written Strategies

- Children use a range of vocabulary to describe multiplication.
- They will explore ways of recording their jottings and representations before progressing to recording sentences using the x and = signs.
- There are no formal written method requirements for multiplication in Year 2.

Return to Contents page

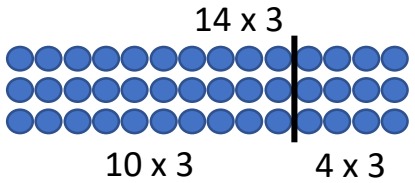
Year 3 Multiplication Objectives

- **Recall and use multiplication facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables).**
- **Count in steps of 4, 8, 50 and 100.**
- **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 strategies and progressing to a formal written method.**
- **Solve problems, including missing number problems, involving multiplication and division, including scaling and correspondence problems, in which n objects are connected to m objects.**

Mental Strategies

- Count in steps of 4, 8, 50, 100 using oral counting and pictorial representations such as number lines and 100 squares.
- Make links (doubles and halves) between 2, 4 and 8x table.
- Use understanding of the **commutative law** to support learning times tables facts: e.g. **I know 8 x 5 = 40 , so 5 x 8 = 40.**
- Use known facts linked to understanding of place value to multiply multiples of 10: e.g. **I know 3 x 8 = 24, so I know 30 x 8 = 240**
- Use understanding of the **distributive law** to partition teen numbers when multiplying by a single digit number:

e.g. **14 x 3 becomes 10 x 3 + 4 x 3.**



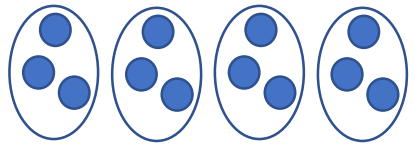
- Use counters and arrays to represent multiplication facts and support understanding, especially of the distributive law.

Written Strategies

- Children explore and develop representations of their jottings and pictorial representations for the multiplications they are attempting.

e.g. **4 x 3 = 12**

4 lots of 3



- Representations may include Base 10, counters, arrays or simple lines and dots.
- Children progress to more efficient methods, using facts they know and a partitioning approach that is a pre-cursor to the formal short multiplication method taught in Year 4:

e.g. **15 x 4 =**

10 x 4 = 40

5 x 4 = 20 +

60

e.g. **45 x 3 =**

40 x 3 = 120

5 x 3 = 15 +

135

- Children continue to use the language of 'groups of' and 'lots of' to understand multiplication:

e.g. **3 x 8 means 3 lots of 8. We can count three 8s : 8, 16, 24**

7 x 4 means 7 lots of 4. We can count seven 4s : 4,8,12,16,20,24,28

Return to Contents page

Year 4 Multiplication Objectives

- **Recall multiplication and division facts for tables up to 12 × 12.**
- **Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.**
- **Recognise and use factor pairs and commutativity in mental calculations.**
- **Multiply two-digit and three-digit numbers by a one-digit number, using a formal written layout.**
- **Solve problems involving multiplying & adding, including using the distributive law to multiply 2-digit numbers by 1-digit, scaling and correspondence problems, such as: n objects are connected to m objects.**

Mental Strategies

- Count in steps of 6, 7, 9, 25 and 1000 using oral counting, apparatus and place value knowledge.
- Use concrete resources to illustrate factor pairs:

15 = 5 x 3

15 = 3 x 5

- Use understanding of the **commutative law** to support learning times tables facts up to 12 x 12: e.g. **I know 9 x 7 = 63 , so 7 x 9 = 63.**
- Use known facts linked to understanding of place value to multiply multiples of 10, 100 ad 1000 as well as tenths:

e.g. **I know 3 x 8 = 24, so I know 3 x 0.8 = 2.4**

Written Strategies

- Children should progress onto formal methods of short multiplication at this stage. This should initially be support with concrete resources, pictorial representations and presented alongside the partitioning method learnt in Year 3, to ensure children gain a clear understanding of the approach.
- Children may initially be shown the short multiplication method in an expanded form before progressing to the compact method:

e.g. **36 x 7 =**

30 + 6		
x 7		
42	**(6 x 7)**	
210	**(30 x 7)**	
252		

3 6	6 lots of 7 = 42.
x 7	
2 5 2	Write 2 in the ones column and exchange the 4 tens below the tens column.
4	

3 (tens) lots of 7 = 21 (tens).

Write the 21 in the hundreds and tens columns, remembering to add the exchanged 4 tens.

- Children continue to use the language of 'groups of' and 'lots of' to understand multiplication:

e.g. **3 x 9 means 3 lots of 9. We can count three 9s : 9, 18, 27**

5 x 11 means 5 lots of 11. We can count five 11s : 11, 22, 33, 44, 55

Return to Contents page

Year 5 Multiplication Objectives

- **Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.**
- **Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.**
- **Establish whether a number to 100 is prime; recall primes up to 19.**
- **Multiply numbers mentally, drawing upon known facts.**
- **Multiply whole numbers and those with decimals by 10, 100 & 1000.**
- **Recognise and use square numbers and cube numbers, as well as the notation for squared (^{2}) and cubed (^{3}).**
- **Multiply numbers up to 4 digits by a 1 or 2-digit number, using a formal written method, including long multiplication for 2-digit numbers.**
- **Solve problems involving multiplication, including using their knowledge of factors and multiples, squares and cubes.**
- **Solve problems involving multiplication, including scaling by simple fractions.**

Mental Strategies

- Children continue to use a range of mental strategies to support their calculations such as partitioning:

e.g. **402 x 6 → 400 x 6 + 2 x 6** **4.5 x 3 = 4 x 3 + 0.5 x 3**

- Children use factors and multiples to simplify calculations:

e.g. **35 x 4 → 7 x 5 x 2 x 2 → 7 x 2 x 10**

24 x 6 → 8 x 3 x 2 x 3 → 8 x 9 x 2

Written Strategies

- Build on the use of the formal method of short multiplication introduced in Y4 by introducing 2 digit x 2 digit multiplications.
- As before this may be support with concrete resources and pictorial representations to ensure children a clear understanding of the approach.
- Children may initially be shown the method of long multiplication in an expanded form before progressing to the compact method:

e.g. **23 x 13**

```
  2 3
x 1 3
-------
    9   (3 x 3)
  6 0   (20 x 3)
  3 0   (3 x 10)
2 0 0   (20 x 10)
-------
2 9 9
```

```
  2 3
x 1 3
-------
  6 9
2 3 0
-------
2 9 9
```

When talking through this method, use the language of place value carefully to ensure children understand what is happening.

Children learn about the zero that is placed in the units column on row 2 as a place holder.

- Where an exchange occurs, these should be placed below:

e.g. **24 x 16**

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

- Progress to calculations involving decimals to 2 d.p.

Return to Contents page

Year 6 Multiplication Objectives

- **Perform mental calculations, including with mixed operations and large numbers.**
- **Multiply 1-digit numbers, with up to 2 decimal places, by whole numbers.**
- **Identify common factors, common multiples and prime numbers.**
- **Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.**
- **Solve problems all four operations.**
- **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.**

Mental Strategies

- Children continue to use a range of mental strategies to support their calculations such as partitioning, number facts and place value knowledge.

Written Strategies

- Children continue to use the formal short and long multiplication methods, with larger numbers and decimals to 2 d.p.
- Continue to use the language of place value when talking through problems, to ensure understanding is clear.
- Children are expected to use mental methods (with jottings) when appropriate, but for other calculations, they should use an efficient, formal written method accurately and with confidence.

Written Strategies

- A formal column method approach as set out below supports children in solving multiplication problems including decimals:

e.g. **3.2 x 12**

```
   1 2
x    3 . 2
-------
     6 . 4
   3 6 . 0
-------
   4 2 . 4
-------
```

- In some cases a more thorough method of long multiplication may need to be used:

e.g. **53.2 x 24**

```
     5 3 . 2
x    2 4
---------
   2 1 2 . 8
   1
 1 0 6 4 . 0
---------
 1 2 7 6 . 8
---------
```

Use the language of place value when initially talking through these problems. E.g
0.2 x 4 is 0.8
3 x 4 is 12. write the 2 in the ones column and exchange the ten **below** the tens column.
5 (tens) x 4 = 20 (tens) . Write these in the hundreds and tens column. Remember to add the exchanged ten.

- Problems will be provided in a range of contexts including the use of scaling, units of measure, large whole numbers (up to 1 million) as well as those with decimals.

Return to Contents page

Division

Models and images

- Number tracks and lines
- Bead strings
- Part whole models
- Rekenrek
- Dienes / Base 10
- Place value counters
- Ten frames
- Numicon
- Cuisenaire
- Counting sticks
- Hundred squares
- Bar model
- IT resources e.g. White Rose, Topmarks, ITPs

Key vocabulary

Share
Lots of
Sets of
Equally
Inverse
Divisor
Repeated subtraction
Divide
Groups of
Halving
Remainders
Quotient
Dividend

Return to Contents page

Year 1 Division Objectives

- **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).**

Mental Strategies

- Children will start with practical sharing, using a variety of resources.
- They will share objects into equal groups, in a variety of situations.
- They begin to use vocabulary associated with division in practical contexts.
- It is important that both concepts of division are introduced and understood, alongside the relevant language. There must be sufficient opportunities to manipulate practical resources, in order to support the learning of the difference between the concepts [**grouping** and **sharing**].
- **Sharing**

"Share these 8 apples equally between 2 children. How many apples will each child have?"

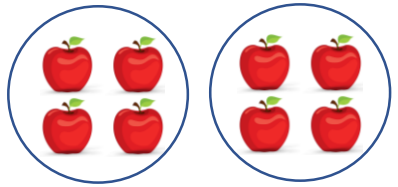
"That' s one for you and one for me; another one for you and another one for me.." etc.

- Each child has 4 apples [use of the word 'fair' supports understanding of equal].

Grouping

- Children move from sharing to grouping in a practical way.

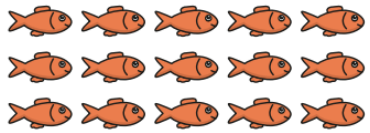
"Put 8 apples into groups of 4. How many groups will there be?"



"Put 20 crayons into groups of 10.

10 go in a pot. How many pots will we use?"

- Children will use a range of practical equipment and pictorial representations to support their understanding of early division.
- Arrays will support children in understanding grouping.

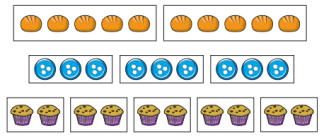


- Children will find and learn halves of even numbers to 20.
- They will explore what happens when you halve an odd number.

Return to Contents page

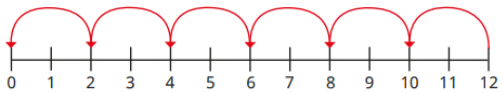
Year 2 Division Objectives

- **Recall and use division facts for the 2, 5 and 10 times tables.**
- **Solve problems involving division, using materials, arrays, repeated subtraction, mental methods, and multiplication and division facts, including problems in contexts.**
- **Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs.**
- **Show that division of one number by another is not commutative [i.e. can be done in any order].**



Mental Strategies

- Children will use a range of vocabulary to describe division and use practical resources, pictures, diagrams and the division (÷) and equals (=) signs to record, using multiples that they know.
- **Halving:** Find half of even numbers up to 40. Explore what happens when halving an odd number.
- Begin to know the halves of multiples of 10 up to 100 (e.g. half of 70 is 35).
- Make links to fractions ½,¼,⅓. Teach explicitly the links between fractions and division (e.g. half is the same as dividing by 2)
- Learn the division facts for 2x, 5x and 10x tables, using relevant vocabulary: 10 divided by 5 / 10 shared between 5 / 10 grouped into 5's
- Make links to repeated subtraction / counting backwards and forwards in equal groups.
- Explore number lines to support counting for division.



- Continue to reinforce concepts of **sharing and grouping** in a practical context, in a variety of ways.

"30 crayons shared equally between 5 pots":
30 divided by 5 = 6 30 ÷ 5 = 6 [**sharing**]
"30 crayons shared equally between 10 pots":
30 divided by 10 = 3 30 ÷ 10 = 3 [**sharing**]

"We have 30 crayons and put 10 crayons in each pot. How many pots do we need?"
30 divided by 10 = 3 30 ÷ 10 = 3 [**grouping**]
"We have 30 crayons and put 3 crayons in each pot. How many pots do we need?"
30 divided by 3 = 10 30 ÷ 3 = 10 [**grouping**]

Written Strategies

- Continue to use arrays to support division. Children will develop ways of recording their jottings.

e.g. **15 ÷ 5 =**

- Children will record division sentences (using facts within their times tables knowledge) using symbols:

e.g. **30 ÷ 10 = 3** **30 ÷ 5 = 5** **20 ÷ 2 = 10**

Return to Contents page

Year 3 Division Objectives

- **Recall and use division facts for the 3, 4 & 8 times tables.**
- **Write and calculate mathematical statements for division, using the multiplication tables that they know, including for 2 digit numbers divided by single-digit numbers, using mental strategies and progressing to formal written methods.**
- **Solve problems, including missing number problems, involving multiplication and division, including scaling and correspondence problems, in which n objects are connected to m objects.**

Mental Strategies

- Children will use practical resources, pictures, diagrams and the division (÷) and equals (=) signs to record jottings, using multiples that they know.
- Recognise that division is not commutative (e.g. 16 ÷ 8 does not equal 8 ÷ 16)
- Relate division to multiplication (i.e. they are the inverse of each other):

e.g. **6 x 5 = 30 is the same as 30 ÷ 5 = 6**

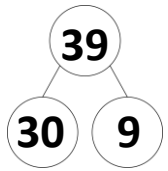
- Use number facts to divide multiples of 10 by single-digit numbers

e.g. **240 ÷ 8 = 30 because we know 24 ÷ 8 = 3**

- Learn the division facts for 3x, 4x, 5x, 8x, and 10x tables, using a range of division vocabulary

e.g. **16 divided by 4 / 16 shared between 4 / 16 grouped into 4's**

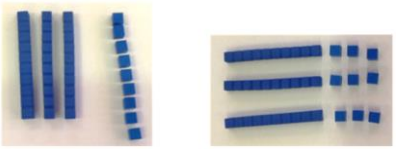
- Divide larger numbers mentally by partitioning into multiples of the divisor

e.g. **39 ÷ 3** 

becomes 30 ÷ 3

and 9 ÷ 3

- Use arrays and practical equipment such as Base 10 to support

e.g. **39 ÷ 3** becomes 

- Use division facts to find unit and non-unit fractions of amounts:

e.g. ¼ of 12 can be solved by 12 ÷ 4 = 3

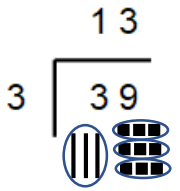
Written Strategies

- Children will continue to use standardised jottings lining closely to their multiplication facts and **grouping** to represent division calculations:

e.g. **20 ÷ 4 = 5** 

- Children learn to use the short division method, initially using jottings to support their understanding:

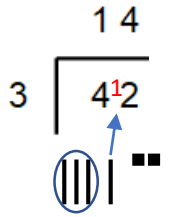
e.g. **39 ÷ 3**



The language of place value supports this method:
- **3 tens into groups of 3 gives one group. Write 1 above the tens column.**
- **9 ones into groups of 3 gives 3 groups. Write 3 above the ones column.**

- Children explore the use of the short division method where there are exchanges:

e.g. **42 ÷ 3**



The language of place value supports this method:
- **3 tens into groups of 3 gives one group. Write 1 above the tens column.**
- **There is 1 ten left which cannot make another group of 3. Exchange it to the ones column.**
- **You now have 12 ones which gives 4 groups of 3. Write 4 above the ones column.**

Return to Contents page

Year 4 Division Objectives

- **Recall division facts for multiplication tables up to 12 × 12.**
- **Use place value, known and derived facts to divide mentally, including dividing by 1.**
- **Recognise and use factor pairs in mental calculations.**
- **Divide two-digit and three-digit numbers by a one-digit number, using formal written layout.**
- **Solve problems involving division, integer scaling problems and harder correspondence problems, such as, n objects are connected to m objects.**

Mental Strategies

- Children will continue to use practical resources, pictures, diagrams alongside the division (÷) and equals (=) signs to record jottings.
- Children learn multiplication facts up to 12 x 12. They can then relate division to multiplication (i.e. they are the inverse of each other):

e.g. **6 x 7 = 42 is the same as 42 ÷ 7 = 6**

- Use number facts to divide multiples of 10 and 100 by single-digit numbers

e.g. **630 ÷ 9 = 70 / 6300 ÷ 9 = 70 because we know 63 ÷ 9 = 7**

- Learn the division facts for up to 12x tables, using a range of division vocabulary

e.g. **66 divided by 11 / 66 shared between 11 / 66 grouped into 11's**

- Children divide two-digit numbers by a single digit number using strategies similar to Year 3

Written Strategies

- Write and calculate mathematical statements for division, using the multiplication tables that the children know

e.g. **84 ÷ 12 = 7**

- Use the **formal written** layout for division, using numbers beyond the multiplication tables that they know:

e.g. **112 ÷ 8 =**

$$\begin{array}{r} 1\ 4 \\ 8\ \overline{)\ 1^{1}1^{3}2} \end{array}$$

The language of place value supports this method:

- **1 hundred cannot make a group of 8, so is exchanged into the tens.**
- **11 tens into groups of 8 gives one group. Write 1 above the tens column. There are 3 tens left.**
- **Exchange 3 tens into the ones column.**
- **32 ones into groups of 8 gives 4 groups. Write 4 above the ones column.**

- Introduce calculations with remainders:

$$\begin{array}{r} 1\ 4\ \text{r}\ 2 \\ 8\ \overline{)\ 1^{1}1^{3}4} \end{array}$$

The language of place value supports this method:

- **1 hundred cannot make a group of 8, so is exchanged into the tens.**
- **11 tens into groups of 8 gives one group. Write 1 above the tens column. There are 3 tens left.**
- **Exchange 3 tens into the ones column.**
- **34 ones into groups of 8 gives 4 groups. Write 4 above the ones column.**
- **There are 2 ones left that cannot make a group of 8. Write r2 after the quotient.**

Return to Contents page

Year 5 Division Objectives

- **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.**
- **Solve problems involving division, including using their knowledge of factors and multiples, squares and cubes.**
- **Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.**
- **Solve problems involving multiplication and division, including scaling by simple fractions.**

Mental Strategies

- Use the multiples of 10 to support partitioning:

e.g. **186 ÷ 3 becomes 30 x 6 = 180 and 1 x 6 = 6 therefore the quotient is 31**

- Use number facts / division facts from times tables to divide multiples of powers of 10 of the divisor:

e.g. **3600 ÷ 9 = 400 using 36 ÷ 9 = 4**

- Use knowledge of multiples and factors, also tests for divisibility, in mental division

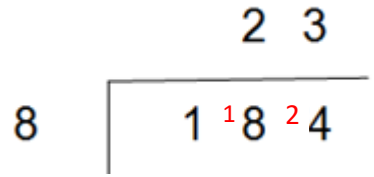
e.g. **246 ÷ 6 = 123 ÷ 3**

- We know that 525 is divisible by 5 because it ends in a 5 and all multiples of 5 end in either a 5 or a 0
- 525 is divisible by 3 because the sum of its digits is divisible by 3 (5 + 2 + 5 = 12)
- Divide whole numbers by 10,100 and 1000 to give whole number answers, or answers with up to 3 decimal places.

Written Strategies

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

e.g. **184 ÷ 8 = 23**

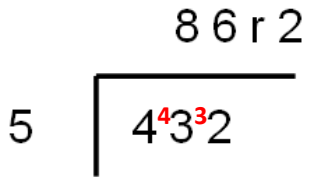


The language of place value supports this method:

- **1 hundred cannot make a group of 8, so is exchanged into the tens.**
- **18 tens into groups of 8 gives two groups. Write 2 above the tens column. There are 2 tens left.**
- **Exchange 2 tens into the ones column.**
- **24 ones into groups of 8 gives 3 groups. Write 3 above the ones column.**

- Solve problems with remainders

e.g. **432 ÷ 5 =**



The language of place value supports this method:

- **4 hundreds cannot make a group of 5, so they are exchanged into the tens.**
- **43 tens into groups of 5 gives 8 groups. Write 8 above the tens column. There are 3 tens left.**
- **Exchange 3 tens into the ones column.**
- **32 ones into groups of 5 gives 6 groups. Write 6 above the ones column.**
- **There are 2 ones left that cannot make a group of 8. Write r2 after the quotient**

- Children learn that the remainder can also be expressed as a fraction:

e.g. **$432 \div 5 = 86\frac{2}{5}$** which is the remainder divided by the divisor.

Return to Contents page

Year 6 Division Objectives

- **Perform mental calculations, including with mixed operations and large numbers.**
- **Divide numbers up to 4 digits by a two-digit whole number, using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.**
- **Divide numbers up to 4 digits by a 2-digit number, using the formal written method of short division and where appropriate, interpreting remainders.**
- **Solve problems involving all four operations.**
- **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.**
- **Use written division methods in cases where the answer has up to 2 decimal places.**

Mental Strategies

- Use multiples of 10 of the divisor to divide large numbers:

e.g. **378 ÷ 9 becomes 40 x 9 = 360 and 2 x 9 = 18 therefore the quotient is 42**

- Use number facts / division facts from times tables to divide decimal numbers by single-digit numbers:

e.g. **2.4 ÷ 6 = 0.4 using 24 ÷ 6 = 4**

- Identify and use common factors, common multiples and prime numbers in mental division: e.g. **288 ÷ 24 = 144 ÷ 12**
- Use tests for divisibility to aid mental calculation e.g. dividing whole numbers by 10, 100, 1000 and 10,000 to give whole number answers, or answers with up to 3 decimal places.
- Know and use equivalence between simple fractions, decimals and percentages including in different contexts.
- Recognise a given ratio and reduce a given ratio to its simplest form.

Written Strategies

- 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).
- **Formal method of long division:** when the divisor is > 12, long division can be used, which involves the repeated subtraction of multiples of the divisor.

e.g. **432 ÷ 15**

- How many 15s are there in 400?
- Make a fact box for the 15s: 15 x 10 = 150 so 15 x 20 = 300.
- Subtract 300 from 432 and write the 20 as 2 tens in the tens column. This leaves 132.
- I can't use 15 x 10 because it is bigger than 132.
- From the fact box: 15 x 8 = 120, which is lower than 132 so I can use it.
- Write 8 in the units column and subtract 120 from 132; leaves 12.
- 12 is smaller than 15, so there are no more groups of 15.
- 12 is the remainder.

*** Children will rarely solve long division problems including remainders.**

432 ÷ 15 becomes

```
      2  8  r 12
   ---------
1 5 | 4  3  2
      3  0  0
   ---------
      1  3  2
      1  2  0
   ---------
         1  2
```

Answer: 28 remainder 12

- Children will learn that they can then use the fact box to support them to use the short division method:

```
      2 8 . 8
   ---------
15 | 4 3 2 . 0
     4 13  12
```

- Children learn to express remainders as fractions or decimals.

e.g. in **432 ÷ 15 the r12 → $\frac{12}{15}$ → $\frac{4}{5}$ → 0.8**

Return to Contents page