# The Mease Federation

**Mary Howard   St. Andrew's**

# Calculation Policy 2022-2023

# Mathematics

During their time at Mease Federation the children will be introduced to a number of different ways to represent numbers. These will enable the children to develop the use of a number of different tools to help them support taught methods and solve calculations.

These are some of the representation the children will become familiar with.

**Numicon**

$6+4$  $7+3$  $8+2$  $9+1$

**Cubes**

$7 = 3 + 4$

$7 - 3 = 4$

First  Then  Now

$4 + 3 = 7$

**Tens Frames**

$7 + 6 = 13$

**Objects**

bundle together groups of 10

7

7

7
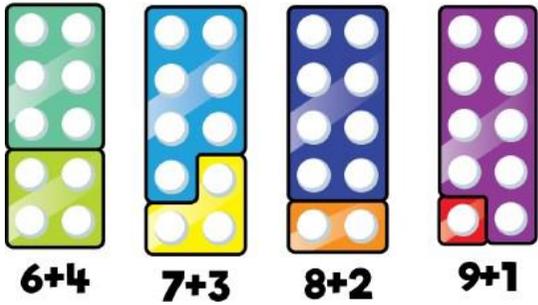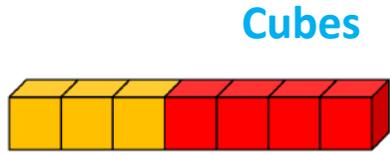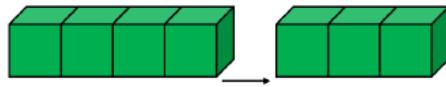
4  3
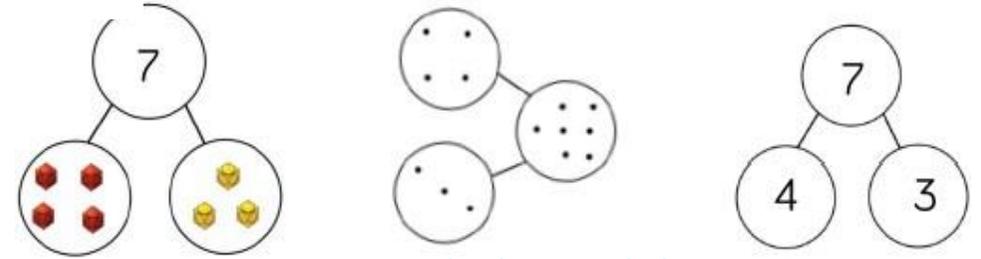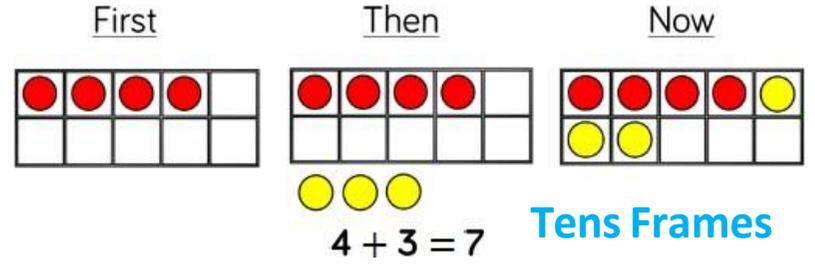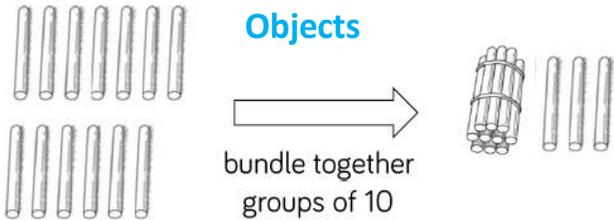
**Part Whole Models**

**Place Value Counters**
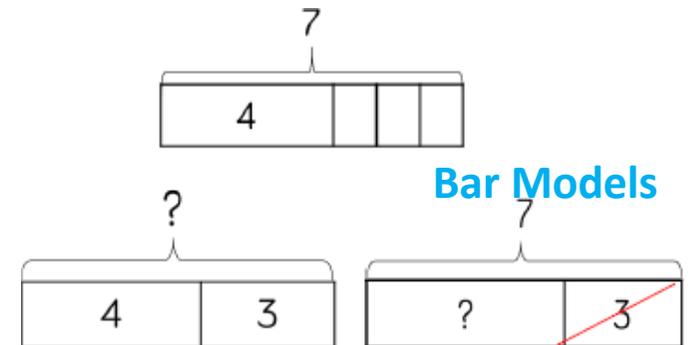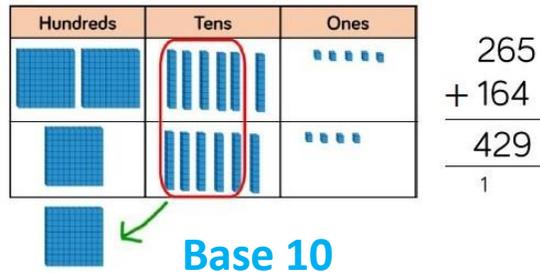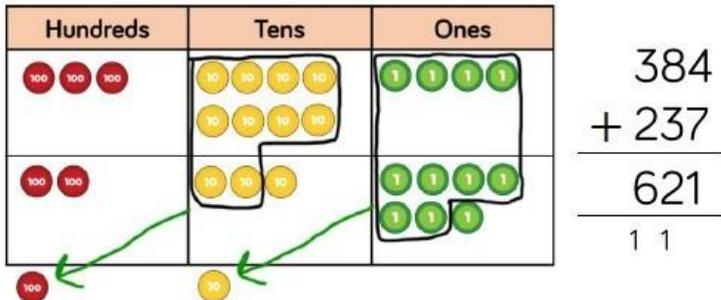
| Hundreds | Tens | Ones |
|----------|------|------|

384
+ 237
621
1 1

| Hundreds | Tens | Ones |
|----------|------|------|

265
+ 164
429
1

**Base 10**

7

4

?

4  3

7

?  3

**Bar Models**

# Addition

| EYFS | Year 1 | Year 2 |
|---|---|---|
| **In EYFS children begin to record in the context of play or practical activities and problems** | <u>Children will</u> — Count and combine sets of objects | <u>Children will</u> — Continue to use a range of equations as in Year 1 but with appropriate, larger numbers. |

<u>Children will</u>— Use games, songs and practical activities to begin using vocabulary

Begin to relate addition to combining two groups of objects

Make a record in pictures, words or symbols of addition activities already carried out.
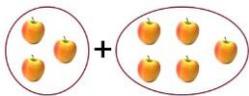


Construct number sentences to go with practical activities
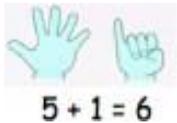


Find one more up to ten.

<u>Deepening learning</u>

Solve simple word problems using their fingers and objects.

Toby has 3 cars and Simon gives 1 more, how many cars does Toby have?



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**Year 1**



Understand that addition can be done in any order and that it is more efficient to put the larger number first.

Understand the concept of equality before using the = sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as the 'answer'. **E.g. 2 =1+1 and 2+3 = 4+1**

Find the missing numbers in a number sentence. The missing number needs to be placed in all possible places

3 + 4 = ?  ? = 3 + 4  3 + ? = 7  7 = ? + 4

Introduce the Number Line

Children use a numbered line to count on in ones and to support calculation. 7 + 4 =
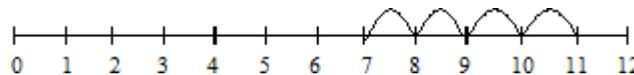


Know all the number bonds within 10.
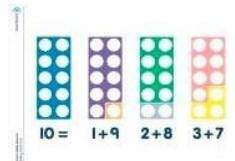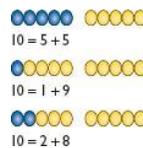


Use equipment such as Base 10 to begin to partition numbers into 10s and 1's.



<u>Deepening learning</u>

Solve one-step word problems using concrete objects and pictorial representation e.g. Peter had 12 apples. He bought 8 more at the greengrocers. How many apples did Peter have altogether?

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**Year 2**

Extend to 14 + 5 = 10 + ? , 32 + ? + ? = 100 and 35 = 1 + ? + 5

**Partition numbers into tens and ones and recombine**

43 + 25 = 68
40  3  20  5

40 + 20 = 60

3 + 5 = 8

60 + 8 = 68

**Count on in tens and ones, using a numberline**

23 + 12 = 23 + 10 + 2

= 33 + 2

= 35
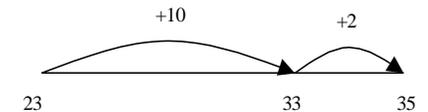


<u>Formal written methods will be introduced where appropriate</u> e.g. 83 + 42 = 125

*Initially*                *then, when confident,*

**1 Expanded column method**        **2 Compacted Column method**

```
   80 + 3              83
+  40 + 2           +  42
  120 + 5 = 125       125
```

<u>Deepening Learning.</u>

Solve one and two- step addition word problems e.g. Mrs Smith left school and drove 12 miles to the library. She left the library and drove 14 miles home. How many miles did she drive?

# Addition

| Year 3 | Year 4 |
|---|---|

## Year 3

**Children will-**

Practise mental methods with increasingly large numbers

Consolidate partitioning and recombining

Use place value counters, empty number lines etc.

+30    +7

55          85    92
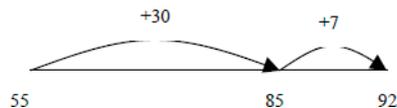
**Develop Partitioned Column Method**

(crossing tens) with up to 3 digits:

**148+23=**

    100 + 40 + 8

+        20 + 3

    100 + 60 +11    =  171

> Once confident, children can start using the partitioning column method to solve problems that bridge the tens and hundreds. boundaries.

**337 + 188 =**

    300 + 30 + 7

    100 + 80 + 8

    400 + 110 + 15 = 525

**Move to the compact column addition method, with "carrying":**

Children who are secure with 3-digit expanded column addition should be moved onto the compact column addition method, being introduced to "carrying" through the use of base 10.

```
  2 7 8
+   9 4
  3 7 2
    1 1
```

**245 + 84 =  245**

           **+  84**

            **329**
             1

Compare the expanded method to the compact column method to develop an understanding of the process and the reduced number of steps involved.

**Deepening Learning**

Solve problems, including missing number problems, using number facts, place value, and more complex addition.

## Year 4

**Children will -**

Add numbers with up to four digits, using the formal written (columnar) method

Add three-digit numbers using

columnar method and then move onto

4 digits.

```
  2 7 8
+ 1 9 4
  4 7 2
  1 1
```

> Remember to reinforce correct place value by reminding them the actual value is 2 hundreds add 1 hundreds, **not 2 add 1**, for example.

Use and apply this method to include decimal addition for money and measurement values.

```
  £12.32
+ £11.81
  £24.13
     1
```

**Deepening Learning**

Solve addition two-step problems in contexts, deciding which methods to use and why.

# Addition

| Year 5 | Year 6 |
|---|---|
| **Children will -** | **Children will -** |

**Children will -**

Add numbers with more than 4 digits including money, measures and decimals with different numbers of decimal places.

```
  2 3,4 8 1
+   1 3 6 2
  2 4 8 4 3
```

Understand the place value of tenths and hundredths and use this to align numbers with different numbers of decimal places.

> It is important that children say 6 tenths add 7 tenths so they understand that they are adding part of a number not a whole number.

```
  £ 2 3 . 5 9
+ £  7 . 5 5
  £ 3 1 . 1 4
```

Understand that empty decimal places can be filled with zero to show the place value in each column.

```
  1 9 . 0 1
    3 . 6 5
+   0 . 7 0
  2 3 . 3 6
```

N.B. To support understanding where necessary children should physically make and carry out the calculation using base 10 or other apparatus then compare their practical version with the written form to develop conceptual understanding.

Deepening Learning

Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.

**Children will -**

Add several numbers of increasing complexity including money, measures and decimals with different numbers of decimal places.

```
    8 1,0 5 9
      3,6 6 8
    1 5,3 0 1
+   2 0,5 5 1
  1 2 0,5 7 9
```

Understand that tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row.

> Zeroes should be added to support place value, showing that there is no value to add.

```
  2 3 . 3 6 1
    9 . 0 8 0
  5 9 . 7 7 0
+   1 . 3 0 0
  9 3 . 5 1 1
```

Deepening Learning

Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.

| Subtraction | | |
|---|---|---|
| EYFS | Year 1 | Year 2 |

**EYFS**

**Children begin to record in the context of play or practical activities and problems**

**Children will**

Begin to relate subtraction to 'taking away'

Use of games, songs and practical activities to begin using vocabulary

Make a record in pictures, words or symbols of subtraction activities already carried out

Construct number sentences

to go with practical activities

5 - 1      = 4
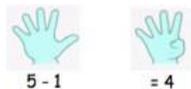
Relate subtraction to taking away and counting how many objects are left.
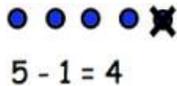
Can find one less to ten.

● ● ● ● ✖

5 - 1 = 4

**Deepening learning —Applying skills**

Solve simple word problems using their fingers and objects. E.g. 'I have 5 apples and I take one away, how many are left?'

**Year 1**

**Children will -**

Understand that subtraction must start with the larger number, counting back the smaller number.

Use a range of equipment for subtraction e.g. Numicon, , multi-link cubes and bead strings.

Subtract 1- digit and 2- digit numbers to 20 using concrete objects and pictorial representation.

Children use a numbered line to count back in ones.

$8 - 3 = 5$

The difference between 7 and 4 is 3.
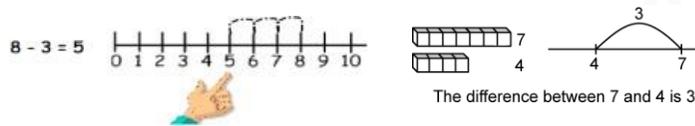
Understand subtraction as finding the difference.

Solve missing number problems such as   $7 = \square - 9$

$15 - 9 = \square$    $20 - \square = 9$    $\square - \square = 11$

Begin to record subtraction number sentences using - and =.

Use the hundred square to find 10 less by looking at the number above.

**Deepening learning —Applying skills**

Begin to subtract to solve simple one-step word problems e.g. Peter bought 5 apples. He gave 2 to his friends. How many did he have left?

• Begin to recognise that subtraction is the inverse of addition

$9 + ! = 10$    $! + 5 = 10$
$10 - 9 = ?$    $10 - ! = 5$
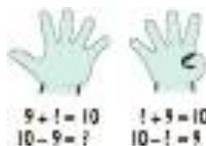
**Year 2**

**Children will -**

Use a number line to find the difference between two Numbers.

Count back in 10s and 1s on the number line 47—

$23 = 24$

24    25    26    27    37    47
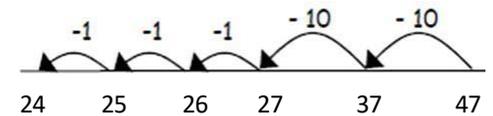
Use a blank number line and draw how many jumps they are counting back. Progression would be to jump in groups of 10's and 1's.

24  27                47

Solve missing number problems

such as multiples of 10  e.g.  $100 \boxed{\phantom{00}} = 20$
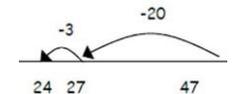
Formal written methods will be introduced where appropriate   e.g. **89 – 35 = 54**

*Initially*                    *then, when confident,*

**1 Expanded column method**          **2 Compacted Column method**

  80 + 9                          89

 - 30 + 5                        - 35

  50 + 4  = 54                    54

**Deepening learning—Applying skills**

Solve one and two- step subtraction word problems e.g. Peter had 20 stamps. He used 5 on Christmas cards and 4 on birthday cards. How many stamps did he have left?

# Subtraction

| Year 3 | Year 4 |
|---|---|

**Children will**

Continue to subtract on a numberline, as needed, using efficient jumps and now apply these to 3 digit number problems. Here is an efficient example of 340 – 127=

**Partitioned column subtraction with 'exchanging' (decomposition):**
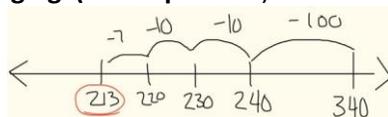


Continue to use expanded column method, as needed, moving to 3 digit numbers when confident.

189 – 135 =

          100 + 80 + 9

    -    100 + 30 + 5

                50 + 4

When introducing 'exchanging' use practical subtraction if needed. Make the larger number with Base 10. Before subtracting 'the larger unit they will need to exchange a row of 10 for ten units then subtract.



$$\begin{array}{r} \overset{60}{\cancel{70}} + \overset{1}{2} \\ -\ 40 + 7 \\ \hline 20 + 5\ =\ \underline{25} \end{array}$$

Once pupils are secure with the understanding of 'exchanging', they can use the partitioned column method to subtract any 2 and 3-digit numbers.



Remember when subtracting money: partition into e.g.

£1 + 30p + 8p

**Deepening learning**

Solve problems, including missing number problems, using number facts, place value, and more complex subtraction.

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**Children will -**

**Partitioned column subtraction with 'exchanging' (decomposition):**

Consolidate their learning of partitioning column method and exchanging by solving calculations with more complex numbers.

Place value counters will come in handy here when building children's confidence. Money can also be partitioned for subtraction e.g. £1 + 30 + 5 - £1 + 10 + 2 =





**Compact column subtraction**

Once confident children are ready to move on to the compact method of subtraction.

**Deepening learning**

Solve subtraction two-step problems in contexts, deciding which methods to use and why.

# Subtraction

| Year 5 | Year 6 |
|---|---|
| **Children will** | **Children will** |

**Children will**

Continue to use the compact column method of subtraction to solve problems including those where exchanging is required.



> Children who are still not secure with number facts and place value will need to revisit partitioned column method until ready for the compact. method

They will subtract larger integers and begin to subtract decimal amounts.

> Place a "zero" in any empty decimal places to aid understanding of what to subtract in that column.



**Deepening learning**

Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

**Children will**

use mental methods and the compact column method of subtraction to solve an increasingly complex range of calculation.



Work on calculations including those with integers, those with decimals and those with mixed numbers.

> **Remember:**
>
> Empty decimal places can be filled with **zero** to show the place value in each column.



**Deepening learning**

Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

| Multiplication | | |
|---|---|---|
| EYFS | Year 1 | Year 2 |
| **Children begin to record in the context of play or practical activities and problems**<br><br>**Children will -**<br><br>Use real life contexts, games and songs and practical equipment to count in repeated groups of the same size:<br><br>Begin to count and chant in twos and tens<br><br>10, 20 30, 40 50, 60, 70 80, 90 100<br><br>Use practical resources to support counting such as Numicon, bead strings, counters, socks, shoes. | **Children will -**<br><br>Understand multiplication is related to doubling and combining groups of the same size.<br><br>Group objects in 2s, 5s and 10s using concrete objects, pictorial representation and arrays.<br><br>4 x 2 = 8<br>2 x 4 = 8<br>2 x 4 = 8<br>4 x 2 = 8<br><br>Begin to understand multiplication as and represent this on a number line<br><br>2 + 2 + 2 + 2 + 2 = 10.<br><br>**Deepening learning-**<br><br>Solve simple one-step word problems involving multiplication e.g. 4 children had 2 pencils each. How many pencils did they have altogether? | **Children will -**<br><br>Continue to use repeated addition number sentences to calculate multiplication<br><br>4  x 3 = 3 + 3 + 3 + 3<br><br>Represent multiplication sums as an array<br><br>5 x 3 = 15<br>3 x 5 = 15<br><br>Explore the fact that multiplication, like addition, can be done in any order<br><br>2 hops of 5<br>5 hops of 2<br><br>Calculate multiplication questions by jumping in groups on a number line.<br><br>+4   +4   +4<br>0   4   8   12<br><br>Children begin to record multiplication number sentences using x and =<br><br>**Deepening learning-**<br><br>Use multiplication to solve more complex word problems including money and measure.<br><br>There are 3 sweets in each bag how many are there in 7 bags altogether? 3+3+3+3+3+3+3 = 21<br><br>7 x 3 = 21 |

| Multiplication | |
|---|---|
| Year 3 | Year 4 |
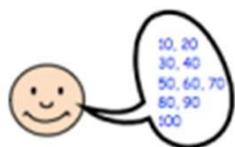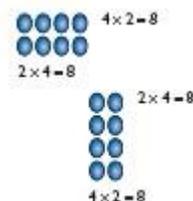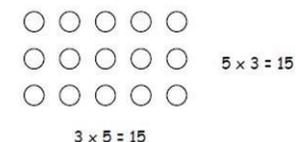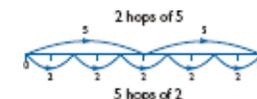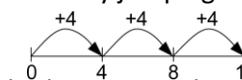
### Year 3

Before moving on to grid multiplication, **children will** need to be able to …

☐ Partition numbers into tens and units

☐ Multiply single digits by multiples of 10 (3 x 30 = 90).

☐ Quickly recall multiplication facts for the 2,3,4,5, 8 and 10 x tables.

☐ Use any previous method to work out unknown multiplication facts, quickly and accurately.

**Children will** begin to use the grid method.
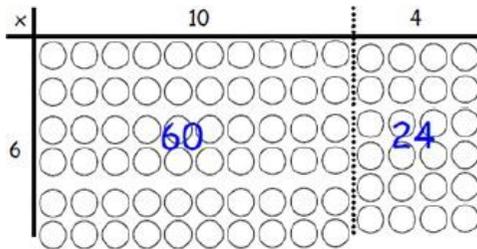


The grid method can be introduced using an arrays model such as the one to the left for 14 x 6.

Children need to use their partitioning skills to partition the two digit number and then use their existing knowledge of arrays to come to an answer with minimal support.

When the children are confident, simple numerical recording will be used.

The children need to remember that once they have multiplied the partitioned parts of the number, they then need to add the two, using column addition if necessary

| × | 30 | 5 |
|---|---|---|
| 7 | 210 | 35 |

210 + 35 = 245

**Deepening Learning**

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10
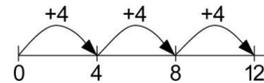
### Year 4

**Children will**

Develop their understanding of grid method

Eg. 136 x 5 = 680

| X | 100 | 30 | 6 |
|---|---|---|---|
| 5 | 500 | 150 | 30 |

Progress to larger numbers

| x | 600 | 10 | 3 |
|---|---|---|---|
| 5 | 3000 | 50 | 15 |

Add up 3000, 50 and 15 to make 3065.

613 x 5 = 3065

Encourage children to add using column method addition at the end for accuracy.

```
    500
    150
 +   30
    680
```

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

When children are confident and accurate multiplying using grid method and also confident in carrying for addition then they are ready to move onto using short multiplication method.

**Deepening Learning**

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.

# Multiplication

| Year 5 | Year 6 |
|---|---|

## Year 5

**Children will**

Use short multiplication in a range of increasingly challenging problems.



Solving using the grid method and then comparing to the short multiplication method will help cement the children's understanding of the short multiplication method.

When multiplying by more than 1 digit, children now need to use long multiplication.



(1234 x 6)
(1234 x 10)

**Deepening Learning**

Solve problems involving multiplication, including scaling by simple fractions and problems involving simple rates.

## Year 6

**Children will  -**

Consolidate all they know about short and long multiplication.

They will also develop their skill using short multiplication to multiply decimal numbers to 2 decimal places.

When multiplying decimals, it is important to remember that the digit you are multiplying by needs to be lined up with the one's digits.

As with all decimal work, the decimal points must be lined up and the children need to have a clear understanding why that is.



**Deepening Learning**

Solve problems involving multiplication including scaling by simple fractions and problems involving simple rates.

| Division | | |
|---|---|---|
| EYFS | Year 1 | Year 2 |

**Children begin to record in the context of play or practical activities and problems**

**Children will -**

Learn how to share objects into equal groups.

Use related vocabulary e.g. half, share, groups of.

Use a range of songs, rhymes and activities including: -

Sharing of milk/fruit at break time
Sharing sweets on a child's birthday
Sharing activities in the home corner
Counting in tens and twos
Separate a given number of objects into two groups.
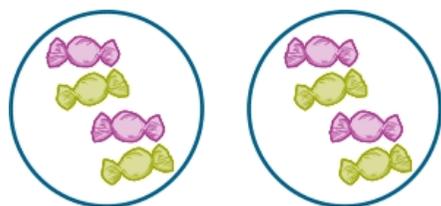
**Year 1**

**Children will -**

Group and share small quantities using objects or pictures - understanding the difference between the two concepts

Apply their counting skills to develop some understanding of grouping e.g. How many groups of 4 can be made with 12 stars? = 3

Use arrays as a pictorial representation for division

15 ÷ 3 = 5 There are 5 groups of 3.

15 ÷ 5 = 3 There are 3 groups of 5.

Find ½ and ¼ and simple fractions of a length, shape, set of objects and quantities by group objects into equal groups

**Deepening learning**

Solve simple one-step word problems involving division e.g. There are 10 cakes and 5 children. How many cakes can they each have? This may be done verbally and using physical objects to 'act out'

**Year 2**

**Children will-**

Continue to use grouping and sharing for division using practical apparatus, arrays, pictorial representations, repeated addition/ subtraction or skip counting

Progress to grouping numbers into equal sets with no remainders

How many groups of 3 are in 12?

12 ÷ 3 = 4
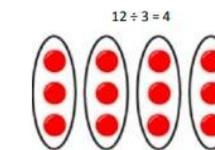
Children should begin to feel increasingly confident with using pictorial representations or counting strategies to calculate division questions.

Begin to record their practical division as a written calculation using ÷ and = in a number sentence.

Understand that division is the inverse of multiplication

Use the multiplication and division facts from 2's 5's and 10's to work out missing number questions.     15 ÷     = 3

Recognise, find, name and write ½ , 1/3, ¼, and ¾ of a length, shape, set of objects and of amounts

Begin to relate division to fractions of numbers and shapes – e.g. ½ and ¼ is the same as dividing by 2 and dividing by 4

**Deepening Learning**

Use division to solve more complex word problems related to real life scenarios e.g. Amy makes 20 cakes. She shares the cakes between 5 plates. Write the calculation to show how many cakes

# Division

| Year 3 | Year 4 |
|---|---|

## Year 3

**Children will -**

Begin to recognise that the 'grouping objects' method is not suitable for larger numbers.

Children will begin to progress to the written method by beginning with partitioning numbers where the columns are easily divisible by the divisor and do not require alternative partitioning methods.

$69 \div 3$

$60 \div 3$   $9 \div 3$
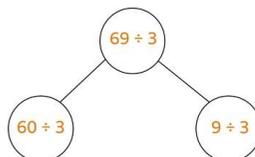
Children will continue to apply this to the bus stop/bus shelter written method, where there are no remainders and no exchanges between columns. Counters should be used and grouped as per the divisor

$63 \div 3 =$

$3\overline{)63}$

Create the dividend using Place Value counters.
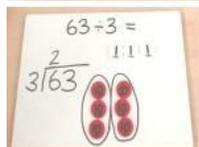
$63 \div 3 =$

$3\overline{)63}$

Group the tens counters according to the divisor and write the number of groups above the line in the tens column.

$63 \div 3 = 21$

$3\overline{)63}$
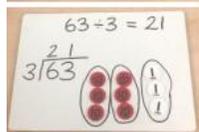
Group the tens counters according to the divisor and write the number of groups above the line in the tens column.

The quotient can be seen across the groups.

As they become more confident, children will progress to drawing the counters then using their related multiplication knowledge to calculate.

In this case below,

$3 \times 3 = 9$ therefore $3 \times 30 = 90$ etc
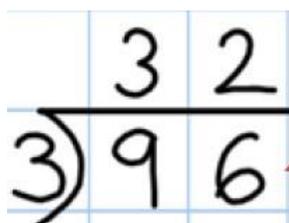
$3\overline{)96}$ gives $32$

### Deepening Learning

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children. Where possible, these questions should be related to a real-life context.

## Year 4

**Children will -**

Continue to use short division to solve division problems.

Once confident with the method of short division, they will move on to problems where digits of the dividend are not a multiple of the divisor and therefore, a remainder will need to be carried through the columns.

$8\overline{)9^16}$ gives $12$

Children who can use short multiplication problems with remainders in the columns (but not in the final answer) are now ready to work on 3 digit problems.

$4\overline{)87^32}$ gives $218$
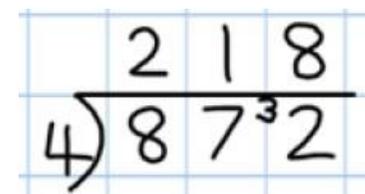
Once children are confident at dividing with 3 digits, they need to attempt problems where the answer in the first column (hundreds column) is a zero. They may wish to record the hundred initially as this will help them remember its place and the numbers value.

$5\overline{)1^17^25}$ gives $035$

### Deepening Learning

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children. Where possible, these questions should be related to a real-life context.

| Division | |
|---|---|
| **Year 5** | **Year 6** |
| Children will - | Children will— |
| Use short division to solve problems up to 4 digits long. | Use short division to divide decimal numbers by single digit numbers. |
| They will use short division to solve problems that have a remainder in the final answer. | |

Year 5 content:



The answer to 5309 ÷ 8 could be expressed as 663 and five eighths, 663 r 5, as a decimal, or rounded as appropriate to the problem involved.

As pupils are introduced to examples that give rise to remainder answers, division it helps to have a real-life problem-solving context, where pupils consider the meaning of the remainder and how to express it, i.e. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem.

**Deepening learning**

Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. Where possible, these questions should be related to a real-life context.

Year 6 content:



The remainder in this answer is 1 but has been expressed as a decimal. Children need to insert a decimal point next to the units and carry the remainder over the decimal point. Zeroes are inserted to the right of the decimal point to show that there was no value.

The final step of division will be long division which will be used to divide numbers by 2 digits.

Any remainders need to be expressed in a way that matched the context of the problem.



45 goes into 130 twice with 40 left over.
130 ÷ 45
Then bring down the next value(9) and divide 409 by 45 which is 9 with four left over.
Finally bring down the final digit (5) and 45 goes into 45 once.

**Deepening Learning**

Solve problems involving division, including scaling by simple fractions and problems involving simple rates. Where possible, these questions should be related to a real life context.