Turvey Primary School

*aim high and smile*

# Maths Calculation Policy

***This policy is largely drawn from the calculations policy of Fynamore Primary*** *compiled by Rosie Pritchard and Alex Winchcombe @Fynamore*
***With additional thanks to*** *St Andrew's Primary School, the WhiteRose maths hub and the NCTEM for some of the images and words used in this document—*

# About our Calculation Policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Early Years Foundation Stage' (EYFS) curriculum. This calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

This policy was updated and amended in detail (May 2020) in order to fully reflect the concrete, pictorial and abstract (CPA) approach that we follow in school. The CPA approach is fundamental in providing pupils with a thorough understanding of the calculations they are doing and support our schools journey to provide pupils with an in-depth, mastery approach, to teaching and learning. Many of these examples also derive from the White Rose calculations policy and tie with the White Rose schemes of learning used across the school. Children should have access to a wide range of counting tools and apparatus throughout.

In addition to providing a clear progression of calculations through a CPA approach across the school, this policy also sets out expectations for mathematical reasoning and times table facts across the school (please see the final pages).

## Age stage expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, **however it is vital that pupils are taught according to the stage that they are currently working at,** being moved onto the next stage as soon as they are ready, or working at a lower stage until they are secure enough to move on.

## Providing a context for calculation:

It is important that any type of calculation is given a real-life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

## Choosing a calculation method:

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:

*To work out a tricky calculation:*

*Can I do it in my head using a mental strategy?* — *Approximate,*

*Could I use some jottings to help me?* — *Calculate,*

*Should I use a written method to work it out?* — *Check it mate!*

# Contents



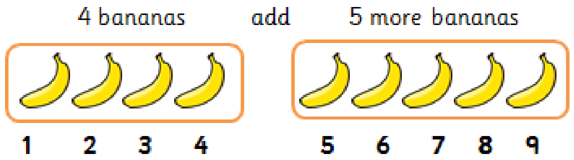
*Examples of **variation** within each calculation can also be found on pages 9, 16, 20 and 27*

# Addition

## Early Stage Add with two single-digit numbers

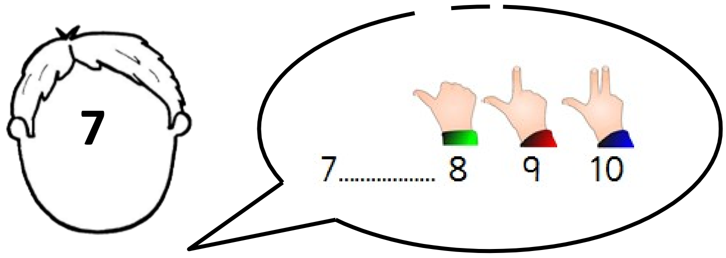
**Using single digit numbers, children learn to recognise the numbers in a written number sentence or when read aloud by an adult. They might solve the problem with objects. E.g.**

4+5=




**Using single digit numbers, put the first number in your head and count on to find the answer**

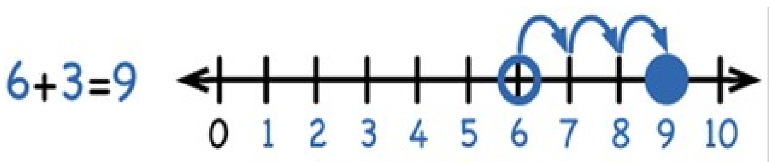
7+3=




**Mental addition:**
Children should be able to quickly recall the number one more than any number to 10 and then beyond by the end of this stage.

## Stage 1 Add with numbers up to 20

Use numbered number lines to add, by counting on in ones. Encourage children to start with the **larger** number and count on.

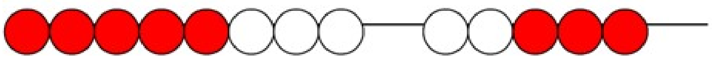



**Children should:**

- Read and write the addition (+) and equals (=) signs within number sentences.
- Interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them: 8 + 3 = ○ 15 + 4 = ○ 5 + 3 + 1 = ○ ○ + ○ = 6

**8 + 5**

Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.

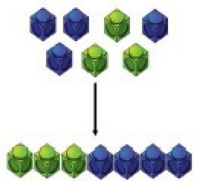
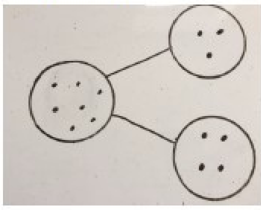
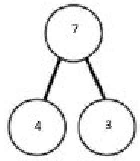
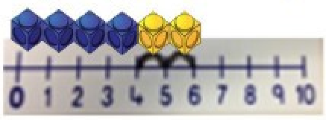
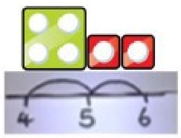
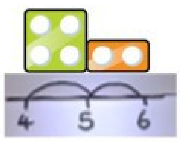
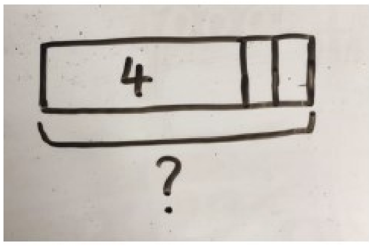
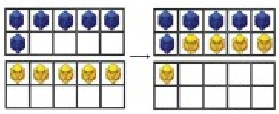
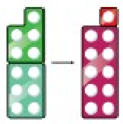
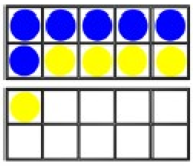


Further guidance of progress in calculations in these first two stages is shown through the Concrete → Pictorial → Abstract (CPA) progression table on the following page.

# Addition

## Early Stage and Stage One (continued)

Using the WhiteRose calculation guidance (linked to the scheme followed in school), the following CPA approach should be used at the 'Early Stage' and 'Stage One' in order to ensure a conceptual understanding.

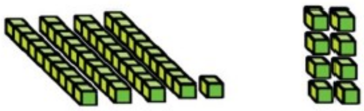
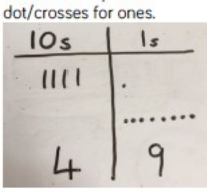
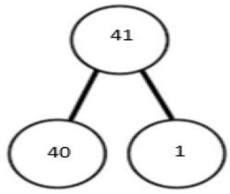
| Concrete | Pictorial | Abstract |
|---|---|---|
| **Combining two parts to make a whole** (use other resources too e.g. eggs, shells, teddy bears, cars).<br> | Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.<br> | 4 + 3 = 7<br>Four is a part, 3 is a part and the whole is seven.<br> |
| **Counting on using number lines** using cubes or Numicon.<br><br><br> | A bar model which encourages the children to count on, rather than count all.<br> | The abstract number line:<br>What is 2 more than 4?<br>What is the sum of 2 and 4?<br>What is the total of 4 and 2?<br>4 + 2<br> |
| **Regrouping to make 10;** using ten frames and counters/cubes or using Numicon.<br>6 + 5<br><br> | Children to draw the ten frame and counters/cubes.<br> | Children to develop an understanding of equality e.g.<br>6 + □ = 11<br>6 + 5 = 5 + □<br>6 + 5 = □ + 4 |

# Addition

## Stage 2 Add with 2-digit numbers

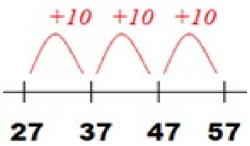
Developing mental fluency with addition and place value involving 2-digit numbers, then establish more formal methods.

Begin with a CPA approach to two digit subtraction:

| TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 | Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. | |
|---|---|---|
|  |  |  |

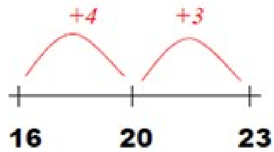
**Add 2-digit numbers and tens:**

**27 + 30**




**Add 2-digit numbers and ones:**

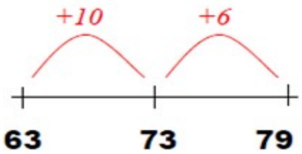
**16 + 7**



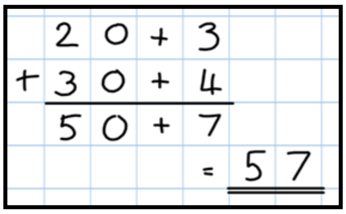

Use empty number lines, concrete equipment, hundred squares etc. to build confidence and fluency in mental addition skills.

**Add pairs of 2-digit numbers, moving to the partitioned column method when secure adding tens and ones:**

**63 + 16**



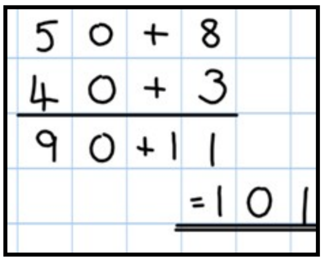

**23 + 34:**




STEP 1: Only provide examples that do **NOT** cross the tens boundary until they are secure with the

STEP 2: Once children can add a multiple of ten to a 2-digit number mentally (e.g. 80+11), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary (e.g. 58 + 43).

**58 + 43:**

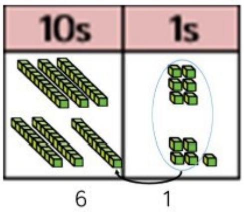
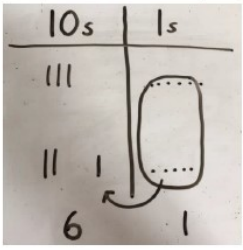



STEP 3: Children who are confident and accurate with this stage should move onto the expanded addition methods with 2 and 3-digit numbers (see STAGE 3).

# Addition

## Stage 3 Add numbers with up to 3-digits

Begin with a CPA approach such as the one in the White Rose calculation guidance:

| TO + TO using base 10. Continue to develop understanding of partitioning and place value.<br>36 + 25 | Chidlren to represent the base 10 in a place value chart. | Looking for ways to make 10. |
|---|---|---|
| <br> | <br> | 36 + 25=<br>1 5<br>30 + 20 = 50<br>5 + 5 = 10<br>50 + 10 + 1 = 61<br>Formal method:<br>36<br>+25<br>61<br>1 |

Following a CPA approach, introduce the **expanded column addition** method:

| | | | |
|---|---|---|---|
| | 2 | 3 | 6 |
| + | | 7 | 3 |
| | | | 9 |
| | 1 | 0 | 0 |
| | 2 | 0 | 0 |
| | 3 | 0 | 9 |

Add the **ones** first, in preparation for the compact method.

**In order to carry out this method of addition:**

- Children need to recognise the value of the hundreds, tens and ones without recording the partitioning.
- Pupils need to be able to add in columns.

Move to the compact **column addition** method, with 'exchanging':

Add **ones** first.

'Carry' numbers **underneath** the bottom line.

```
  236
+  73
  309
   1
```

Children who are very secure and confident with 3-digit expanded column addition should be moved onto the **compact column addition** method, being introduced to 'exchanging' for the first time. Compare the expanded method to the compact column method to develop an understanding of the process and the reduced number of steps involved.

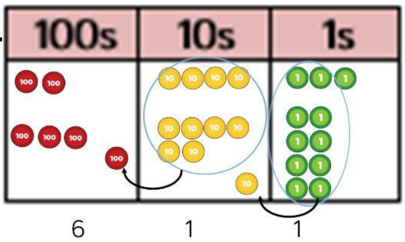
Remind pupils the actual value is '**three tens** add **seven tens**', not 'three add seven', which equals **ten** tens.

# Addition

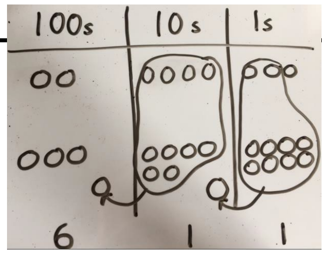
## Stage 4 Add numbers with up to 4 digits

From here on, continue to review a concrete and pictorial approach as appropriate before moving on to a more abstract approach e.g.

Use of place value counters to add HTO + TO, HTO +HTO etc. When there are 10 ones in the 1s column we exchange for 1 ten, when here are 10 tens in the 10s column we exchange for 1 hundred.



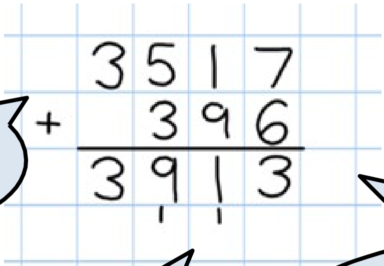

Children to represent the counters in a place value chart, circling when they make an exchange.




Move from expanded addition to the compact column method, **adding ones first**, and 'exchanging' numbers **underneath** the calculation. Also include money and measures contexts.

**e.g. 3517 + 396 = 3913**

Introduce the **compact column addition** method by asking children to add the two given numbers together using the method that they are familiar with (expanded column addition—see STAGE 3). Teacher models the compact method with exchanging, asking children to discuss similarities and differences and establish how it is carried out.




Add **ones** first.

'Carry' numbers **underneath** the bottom line.

Reinforce correct place value by reminding them the actual value is <u>5 hundreds</u> add <u>3 hundreds</u>, **not 5 add 3**, for example.

Use and apply this method to money and measurement values.

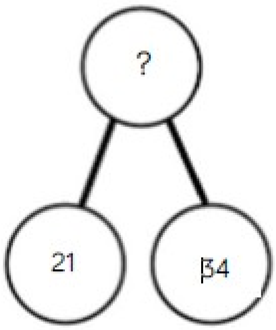
## Stage 4 onwards

In addition to challenge through larger numerals, ensure challenge and mastery are developed through 'variation' in the way addition problems are presented from here onwards.

## Variation in addition

Once children can solve addition problems with 3 digit numbers they can begin to apply this with 4 or more digits (see stages 5 and 6). However, once pupils have mastered addition up to and including stage 4, it is important to ensure further challenge and mastery are developed through 'variation' in the way addition problems are presented from here onwards.

These examples are taken from the White Rose calculation policy (linked to planning documents used in school):




| ? | |
|---|---|
| 21 | 34 |

$$\begin{array}{r} 21 \\ +34 \\ \hline \\ \hline \end{array}$$

$21 + 34 =$

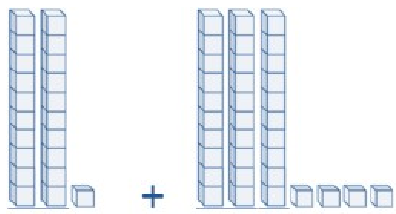
$\boxed{\phantom{00}} = 21 + 34$

Calculate the sum of twenty-one and thirty-four.

**Word problems:**

In year 3, there are 21 children and in year 4, there are 34 children. How many children in total?

21+34=55. Prove it




Missing digit problems:

| 10s | 1s |
|---|---|
| 10 10 | 1 |
| 10 10 10 | ? |
| ? | 5 |

Addition

## Stage 5 Add numbers with more than 4 digits

including money, measures and decimals with different numbers of decimal places.

```
  £23·59
+ £ 7·55
  £31·14
    1 1 
```

The decimal point should be aligned in the same way as the other place value columns, and must be in the same column in the answer.

```
  23481
+  1362
  24843
     1
```

Numbers should exceed 4 digits.

```
  19·01
   3·65
+  0·7
  23·36
  1 1
```

Pupils should be able to add more than two values, carefully aligning place value columns.

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

Say '6 tenths add 7 tenths' to reinforce place value.

**Children should:**

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

## Stage 6 Add several numbers of increasing complexity

```
  23·361
   9·08
  59·77
+  1·3
  93·511
  2 1  2
```

Adding several numbers with different numbers of decimal places (including money and measures):

- Tenths, hundredths and thousandths should be correctly aligned, with the decimal point

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

```
   81,059
    3,668
   15,301
+  20,551
  120,579
   1 1 1 1
```

Extend by adding several numbers with more than 4 digits.

**Pupils should also be able to perform mental calculations including with mixed operations and with larger numbers.**

# Subtraction

## Early Stage Subtract from numbers up to 10

### Subtracting by taking away

Using everyday problems and simple number sentences, children remove or cross out some objects in order to discover how many are left e.g.

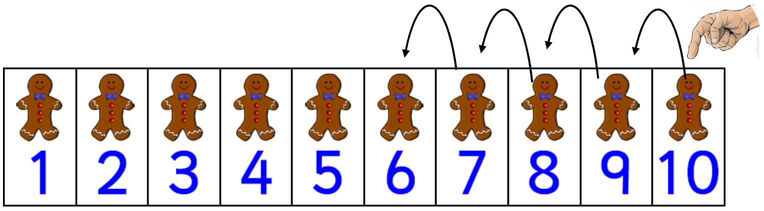
There are 8 monkeys on a tree. 2 jump off. How many are left?

8-2=6

### Counting back to find the answer

Using a simple number track or game board, children count backwards to find the answer e.g.:

10-4=




### Mental subtraction:

Children should be able to quickly recall the number one less than any number to 10 and then beyond by the end of this stage.

## Stage 1 Subtract from numbers up to 20

Read, write and interpret number sentences with - and =

Children consolidate understanding of subtraction practically, showing subtraction on bead strings, using cubes etc. and in familiar contexts. They are introduced to more formal recording including recording on a number line once secure with the practical concept of subtraction. A clear sequence through a concrete (practical), pictorial and abstract approach to subtraction in the early stage and stage one is shown on the next page.

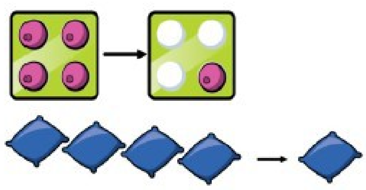
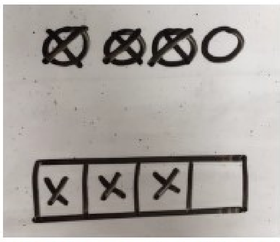
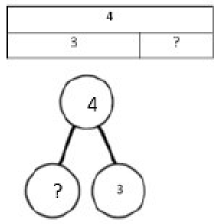
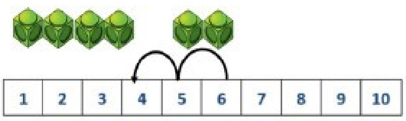
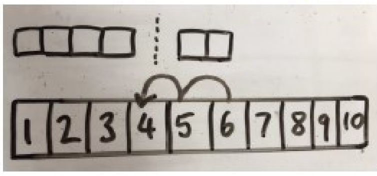
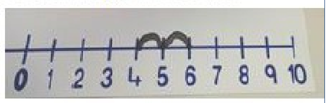
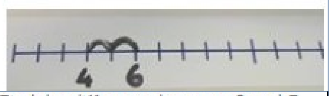
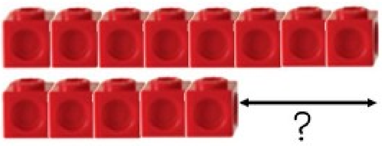
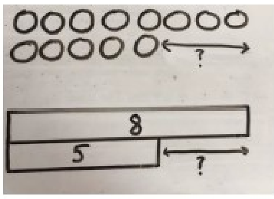
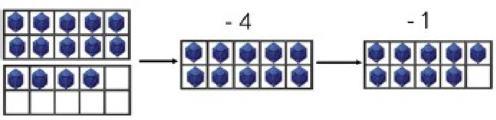
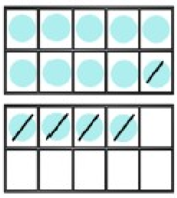
### Mental subtraction

Children should start recalling subtraction facts up to **and within** 10 and 20 by the end of this stage, and should be able to subtract zero.

# Subtraction −

## Early Stage and Stage One (continued)

Using the White Rose calculation guidance (aligned to the scheme followed in school), the following CPA approach should be used at the 'Early Stage' and 'Stage One' in order to ensure a conceptual understanding.

| Concrete | Pictorial | Abstract |
|---|---|---|
| **Physically taking away and removing objects from a whole** (ten frames, Numicon, cubes and other items such as beanbags could be used).<br><br>4 - 3 = 1<br> | Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.<br> | 4- 3 =<br><br>□ = 4 - 3<br> |
| **Counting back** (using number lines or number tracks) children start with 6 and count back 2.<br><br>6 - 2 = 4<br> | Children to represent what they see pictorially e.g.<br> | Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line<br> |
| **Finding the difference** (using cubes, Numicon or Cuisenaire rods, other objects can also be used).<br><br>Calculate the difference between 8 and 5.<br> | Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.<br> | Find the difference between 8 and 5.<br><br>8 – 5, the difference is □<br><br>Children to explore why<br>9 - 6 = 8 – 5 = 7 – 4 have the same difference. |
| **Making 10** using ten frames.<br>14 – 5<br> | Children to present the ten frame pictorially and discuss what they did to make 10.<br> | Children to show how they can make 10 by partitioning the subtrahend.<br><br>14 - 5 = 9<br>4 1<br><br>14 – 4 = 10<br>10 – 1 = 9 |

# Subtraction

## Stage 2 Subtract with 2-digit numbers

**Subtract on a number line by** counting back, aiming to develop mental subtraction skills.

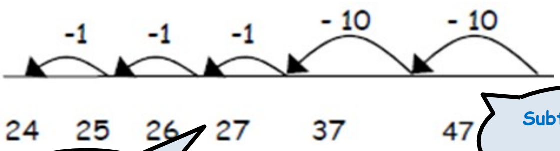
Use Dienes blocks for subtraction calculations too.

This strategy will be used for:

- **2-digit numbers subtract ones** (by taking away / counting back) e.g. 36—7
- **2-digit numbers subtract tens** (by taking away / counting back) e. g. 48—30
- **Subtracting pairs of 2-digit numbers** (see below: )

**Subtracting pairs of 2-digit numbers on a number line:**

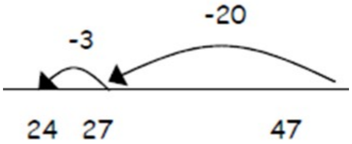
**47 - 23 = 24** Partition the second number and subtract it in tens and ones, as below:




Subtract tens first.

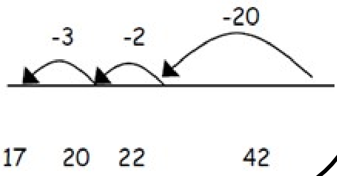
Then subtract ones.

Move towards more efficient jumps back, as below:




Combine methods with use of a hundred square to reinforce understanding of number value and order.

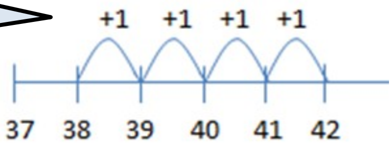
Teaching children to **bridge through ten** can help them to become more efficient, for example 42—25:




Mental strategy – *count on*

42 – 38 = 4

Start with the smaller number and count on to the largest.



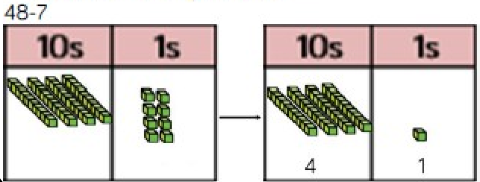

Many mental strategies are taught. Children are taught to recognise that when numbers are close together, it is more efficient to **count on** the difference. They need to be clear about the relationship between addition and subtraction.

## Stage 3 Subtracting with 2 and 3-digit numbers.

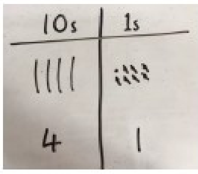
Introduce **partitioned column subtraction** method.

Step 1: Begin with a CPA approach for a calculation where no 'exchanging' is required e.g.:

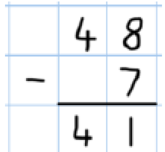
Column method using base 10.
48-7




Children to represent the base 10 pictorially.




Column method or children could count back 7.

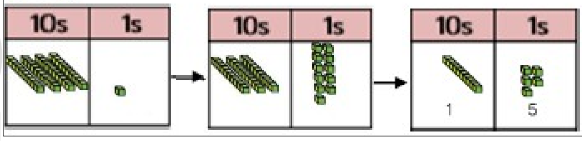


# Subtraction

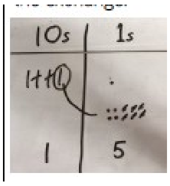
## Stage 3 (cont) Subtracting with 2 and 3-digit numbers.

**STEP 2:** introduce 'exchanging' through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.

Column method using base 10 and having to exchange.
41 − 26




Represent the base 1-0 pictorially, remembering to show the exchange




Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.

$$\begin{array}{rcc} & \cancel{4}^{3} & {}^{1}1 \\ - & 2 & 6 \\ \hline & 1 & 5 \end{array}$$

When learning to 'exchange', explore 'partitioning in different ways' so that pupils understand that when you exchange, the **VALUE** is the same ie **72** = 70+2 = 60+12 = 50+22 etc. Emphasise that the **value hasn't changed**, we have just partitioned it in a different way.

**72 - 47**

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

Before subtracting '7' from the 72 blocks, they will need to exchange a row of 10 for ten ones. Then

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

238 − 146 = 92

$$\begin{array}{rl} & \overset{100}{\cancel{200}} + {}^{1}30 + 8 \\ - & 100 + 40 + 6 \\ \hline & 0 + 90 + 2 \end{array}$$

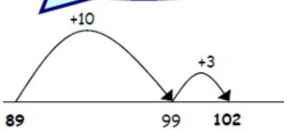
Subtracting money: partition into say £1 + 30p + 8p

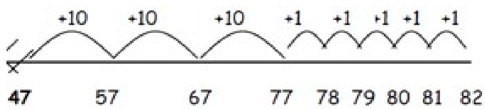
### **Counting on** as a mental strategy for subtraction:

Continue to reinforce counting **on** as a strategy for **close-together numbers** (e. g. 121—118), and also for numbers that are 'nearly' multiples of 10, 100, 1000 or £s, which make it easier to count on (e.g. 102-89, 131—79, or calculating change from £1 etc.).

- Start at the smaller number and count on in **tens** first, then count on in ones to find the rest of the difference:

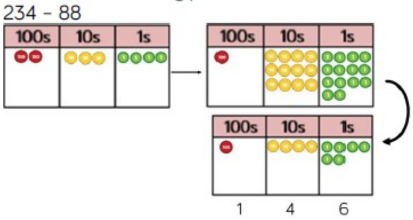
*Because counting on in tens is the way we use a 100 square.*



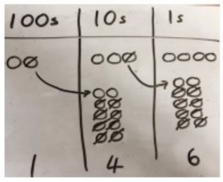




A CPA approach at stage three may look like...

Column method using place value counters.
234 − 88




Represent the place value counters pictorially; remembering to show what has been exchanged.




Formal colum method. Children must understand what has happened when they have crossed out digits.

$$\begin{array}{r} 2\overset{2}{\cancel{3}}\overset{1}{4} \\ -\ \ 88 \\ \hline 6 \end{array}$$

# Subtraction

## Stage 4 Subtract with up to 4-digit numbers

Partitioned column subtraction with 'exchanging' (decomposition):

$2754 - 1562 = 1192$

$$
\begin{array}{rcccccc}
 & 2000 & + & \overset{600}{\cancel{700}} & + & {}^{1}50 & + & 4 \\
- & 1000 & + & 500 & + & 60 & + & 2 \\
\hline
 & 1000 & + & 100 & + & 90 & + & 2
\end{array}
$$

As introduced in STAGE 3, but moving towards more complex numbers and values. Use **place value counters** to reinforce 'exchanging'.

Subtracting money: partition into £1 + 30 + 5 for example.

Compact column subtraction

$$
\begin{array}{rcccc}
 & 2 & \overset{6}{\cancel{7}} & {}^{1}5 & 4 \\
- & 1 & 5 & 6 & 2 \\
\hline
 & 1 & 1 & 9 & 2
\end{array}
$$

To introduce the compact method, ask children to perform a subtraction calculation with the familiar partitioned column subtraction then display the compact version for the calculation they have done. Ask pupils to consider how it relates to the method they know, what is similar and what is different, to develop an under- standing of it

Give plenty of opportunities to apply this to money and measures.

Always encourage children to consider the best method for the numbers involved—mental, counting on, counting back or written method

**Mental strategies**

A variety of mental strategies must be taught and practised, including counting on to find the difference where numbers are closer together, or where it is easier to count on

## Stage 5 Subtract with at least 4-digit numbers

including money, measures, decimals.

Compact column subtraction (with 'exchanging').

Subtracting with larger integers.

$$
\begin{array}{rccccc}
 & {}^{2}\cancel{3} & {}^{10}\cancel{1} & {}^{1}0 & {}^{4}\cancel{5} & {}^{1}6 \\
- & & 2 & 1 & 2 & 8 \\
\hline
 & 2 & 8, & 9 & 2 & 8
\end{array}
$$

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

Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point.

$$
\begin{array}{rcccccc}
 & {}^{6}\cancel{7} & {}^{10}\cancel{1} & {}^{1}6 & \overset{8}{\cancel{9}} & \cdot & {}^{1}0 \\
- & & 3 & 7 & 2 & \cdot & 5 \\
\hline
 & 6 & 7 & 9 & 6 & \cdot & 5
\end{array}
$$

Add a 'zero' in any empty decimal places to aid understanding of what to subtract in that column.

# Subtraction

## Stage 6 **Subtracting with increasingly large and more complex numbers and decimal values.**

| | | |
|---|---|---|
| | 150,699 | |
| − | 89,949 | |
| | 60,750 | |

Using the compact column method to subtract more complex integers

| | | |
|---|---|---|
| | 105.419 | kg |
| − | 36.08 | kg |
| | 69.339 | kg |

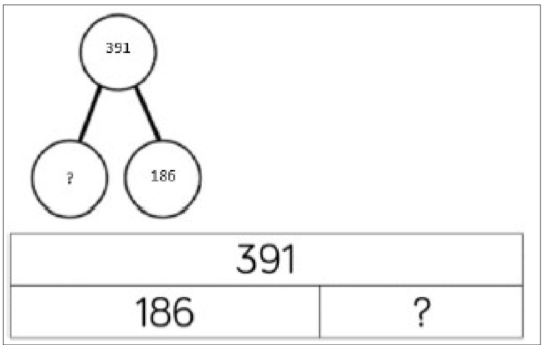
Using the compact column method to subtract money and measures, including decimals with different numbers of decimal places.

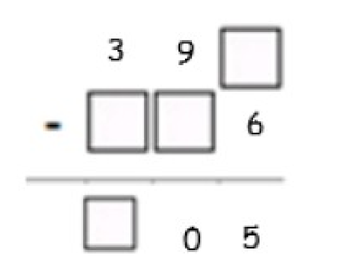
Pupils should be able to apply their knowledge of a range of mental strategies, mental recall skills, and informal and formal written methods when selecting **the most appropriate method** to work out subtraction problems.

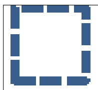
## Variation in subtraction

Children should be given frequent opportunities for variation in how problems are presented or, in how they may be expected to solve them

These examples are taken from the White Rose calculation policy showing different ways to ask children to solve 391-186:




 = 391 − 186

391
-186

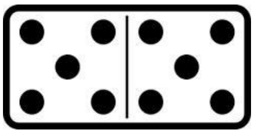
What is 186 less than 391?

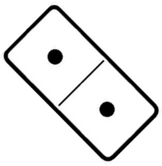
Raj spent £391, Timmy spent £186. How much more did Raj spend?

Calculate the difference between 391 and 186.

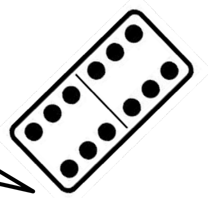
# Multiplication

## Early Stage Solve problems involving doubling.

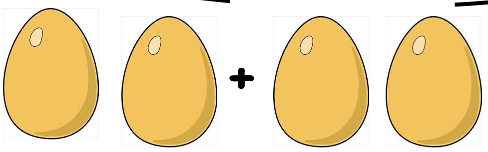




Look at this doubles domino. How many spots are there altogether ?



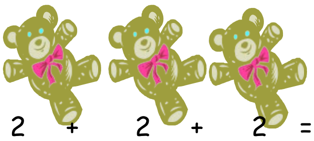
We need to double this recipe. It says two eggs. How many eggs do we need when we double it?




- Children need experience of solving everyday problems where double the quantity is needed (for example, double the amount of toast, double the number of forks at the table, double the number of cups).
- Children may begin some quick recall of doubles facts such as "double 2 is 4" through game playing. For example, roll a dice and double the number it lands on.

## Stage 1 Multiply with concrete objects, arrays and pictorial representations.

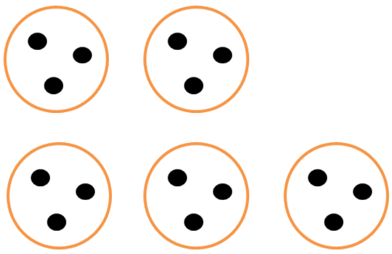
How many legs will 3 teddies have?



2 + 2 + 2 = 6

There are 3 sweets in one bag.
How many sweets are in 5 bags altogether?

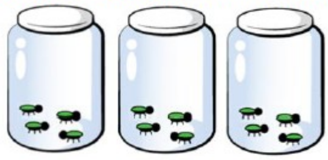
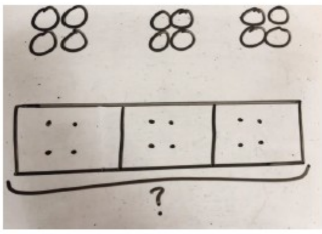
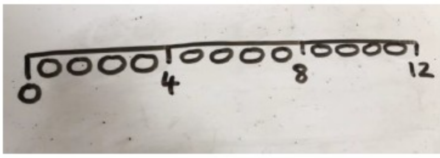
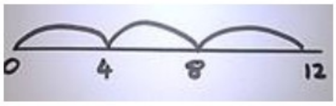
3+3+3+3+3 = 15



- Give children experience of counting equal group of objects in 2s, 5s and 10s.
- Present practical problem solving activities involving counting equal sets or groups,

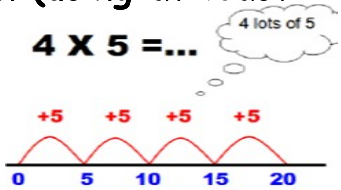
# Multiplication

## Early Stage into stage 2 steps through the Concrete, Pictorial and Abstract

| Concrete | Pictorial | Abstract |
|---|---|---|
| Repeated grouping/repeated addition<br>$3 \times 4$<br>$4 + 4 + 4$<br>There are 3 equal groups, with 4 in each group.<br><br> | Children to represent the practical resources in a picture and use a bar model.<br> | $3 \times 4 = 12$<br><br>$4 + 4 + 4 = 12$ |
| Number lines to show repeated groups-<br>$3 \times 4$<br><br><br>Cuisenaire rods can be used too. | Represent this pictorially alongside a number line e.g.:<br> | Abstract number line showing three jumps of four.<br><br>$3 \times 4 = 12$<br> |

## Stage 2 Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

**4 X 5 =...**

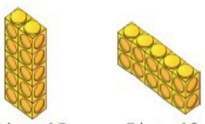
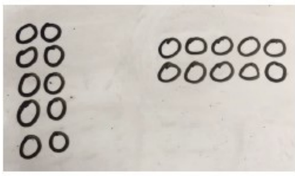



### Use repeated addition on a number line:

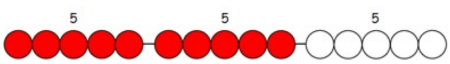
Starting from zero, make equal jumps up on
a number line to work out multiplication facts and write multiplication statements using x and = signs.

**4 X 5 = 20**

### Use practical apparatus and a CPA approach

| Use arrays to illustrate commutativity counters and other objects can also be used. | Children to represent the arrays pictorially. | Children to be able to use an array to write a range of calculations e.g. |
|---|---|---|
| $2 \times 5 = 5 \times 2$<br><br>2 lots of 5    5 lots of 2 |  | $10 = 2 \times 5$<br>$5 \times 2 = 10$<br>$2 + 2 + 2 + 2 + 2 = 10$<br>$10 = 5 + 5$ |

$5 \times 3 = 5 + 5 + 5$




### Use mental recall:

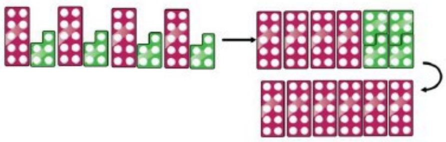
- Children should begin to **recall multiplication facts for 2, 5 and 10** times tables through practice in counting and understanding of the operation.

# Multiplication

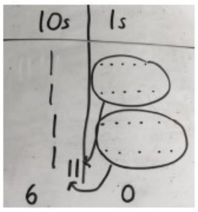
## Stage 3 Multiply 2-digits by a single digit number

Begin with objects then record pictorially before more abstract recording (see below the

**Partition to multiply** using Numicon, base 10 or Cuisenaire rods.
4 × 15



Children to represent the concrete manipulatives pictorially.

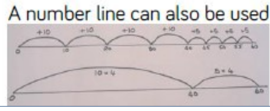



Children to be encouraged to show the steps they have taken.

4 × 15
10 5

10 × 4 = 40
5 × 4 = 20
40 + 20 = 60

A number line can also be used



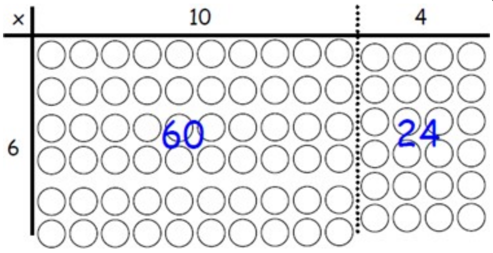
(examples from the White Rose calculations policy)

**Introduce the grid method for multiplying 2-digit by single-digits:**
Link the layout of the grid to an array initially:

Eg. 23 x 8 = 184

| X | 20 | 3 |
|---|---|---|
| 8 | 160 | 24 |

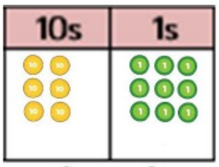
**160 + 24 = 184**




Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format

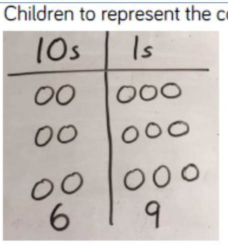
Work towards more formal by working through clear steps with place value counters (concrete resources), drawing (pictorial representation) eventually leading to more abstract written work.

**Formal column method** with place value counters (base 10 can also be used.) 3 × 23



6 9

Children to represent the counters pictorially.




Children to record what it is they are doing to show understanding.

3 × 23
20 3

3 × 20 = 60
3 × 3 = 9
60 + 9 = 69

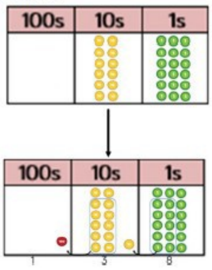
$$\begin{array}{r} 23 \\ \times \ 3 \\ \hline 69 \\ \hline \end{array}$$

# Multiplication

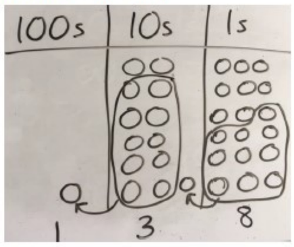
**Stage 4** **Multiply 2 and 3-digits by a single digit,** using all multiplication tables up to 12 x 12

Review and extend the Concrete, Pictorial and Abstract (CPA) approach used in stage 3, as exampled below from the White Rose Calculation Policy. Apply this to three-digit numbers.

Formal column method with place value counters.
6 x 23




Children to represent the counters/base 10, pictorially e.g. the image below.




Formal written method

6 x 23 =

$$\begin{array}{r} 23 \\ \times\ \ 6 \\ \hline 138 \\ \hline {\scriptstyle 1\ 1} \end{array}$$

Eg. 136 x 5 = 680

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

The grid method may also be developed

$$\begin{array}{r} 500 \\ 150 \\ +\ \ 30 \\ \hline 680 \end{array}$$

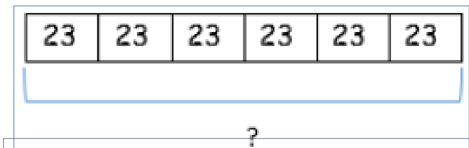
Encourage c column addition to add accurately

Move onto **short multiplication** (see stage 5) if and when children are confident and accurate in multiplying 2 and 3-digit numbers by a single digit this way, **and** are already confident in 'exchanging' for written addition.

## Variation in Multiplication

Children should be given frequent opportunities for variation in how problems are presented or, in how they may be expected to solve them. An ability to solve problems in a variety of ways develops Maths Mastery.

These examples are taken from the White Rose calculation policy showing different ways to ask children to solve 6 x 23 (but is equally applied to larger values):




Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?
With the counters, prove that 6 x 23 =138

Find the product of 6 and 23

6 × 23 =

$\boxed{\phantom{0}}$ = 6 × 23

$$\begin{array}{r} 6 \\ \times\ \ 23 \\ \hline \phantom{00} \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times\ \ 6 \\ \hline \phantom{00} \\ \hline \end{array}$$

What is the calculation?
What is the product?

# Multiplication

## Stage 5 Multiply up to 4-digits by 1 or 2 digits.

Introducing column multiplication

- Introduce by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method.
- Children need to be taught to approximate first, e.g. for **72 x 38, they will use rounding: 72 x 38** is approximately 70 x 40 = **2800**, and use the approximation to check the reasonableness of their answer against.

### Short multiplication for multiplying by a single digit

| x | 300 | 20 | 7 |
|---|---|---|---|
| 4 | 1200 | 80 | 28 |

Move from a grid method to an expanded column method.

| | | | | | |
|---|---|---|---|---|---|
| | | 3 | 2 | 7 | |
| | x | | | 4 | |
| | | | 2 | 8 | |
| | | | 8 | 0 | |
| | 1 | 2 | 0 | 0 | |
| | 1 | 3 | 8 | 0 | |

| | | | |
|---|---|---|---|
| | 3 | 2 | 7 |
| × | | | 4 |
| 1 | 3 | 0 | 8 |
| | 1 | 2 | |

Pupils could be asked to work out a given calculation using the grid, and then compare it to 'your' column method. What are the similarities and differences? Unpick the steps and show how it reduces the steps. needed.

| | 10 | 8 |
|---|---|---|
| 10 | 100 | 80 |
| 3 | 30 | 24 |

| | | | |
|---|---|---|---|
| | | 1 | 8 |
| | × | 1 | 3 |
| | | 5 | 4 |
| | | 2 | |
| | 1 | 8 | 0 |
| | 2 | 3 | 4 |

18 x 3 on the 1st row

(8 x 3 = 24, exchanging the 2 for twenty, then '1' x 3).

18 x <u>10</u> on the 2nd row. Put a zero in ones first, then say 8 x 1, and 1 x 1.

The grid could be used to introduce long multiplication, as the relationship can be seen in the answers in each row.

Approximate,

Calculate,

Check it mate!

Introduce **long multiplication for multiplying by 2 digits**

| | | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| × | | | 1 | 6 |
| | 7 | 4 | 0 | 4 |
| | 1 | 2 | 2 | |
| 1 | 2 | 3 | 4 | 0 |
| 1 | 9, | 7 | 4 | 4 |

(1234 x 6)

(1234 x 10)

| | | | | |
|---|---|---|---|---|
| | 3 | 6 | 5 | 2 |
| × | | | | 8 |
| 2 | 9, | 2 | 1 | 6 |
| | 5 | 4 | 1 | |

**Moving towards more complex numbers**

# Multiplication

**Stage 6** **Short and long multiplication as in Stage 5, and multiply decimals with up to 2d.p by a single digit.**

| | | | | |
|---|---|---|---|---|
| | 3 | · | 1 | 9 |
| × | 8 | | | |
| 2 | 5 | · | 5 | 2 |
| | 1 | | 7 | |

Line up the decimal points in the question and the answer.

Remind children that the single digit belongs in the ones column.

This works well for multiplying money (£.p) and other measures.

**Children will be able to:**

- Use rounding and place value to make approximations before calculating and use these to check answers against.
- Use **short multiplication** (see stage 5) to multiply numbers with **more than 4-digits by a single digit**; to multiply money and measures, and to **multiply decimals with up to 2d.p. by a single digit**.
- Use **long multiplication** (see stage 5) to multiply numbers with **at least 4 digits by a 2-digit number**.

Approximate,
Calculate,
Check it mate!

# Division

## Early stage Solve practical problems involving halving and sharing

**Halving:**

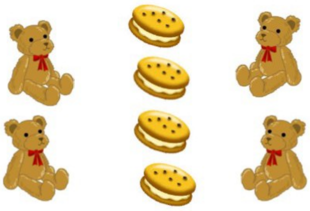
How many cakes on the plate?
Take half of them off.

How many did you take off?
How many are left?

Other questions might include: Put half of: the sheep in the field… the cars in the garage… the dinosaurs in the forest… the animals in the ark…

**Sharing:**

- Find **half** of a group of objects by sharing into 2 equal groups.



- Share a group of objects fairly between themselves and others.

Can you share the biscuits out between the teddies. How many biscuits does each teddy get?

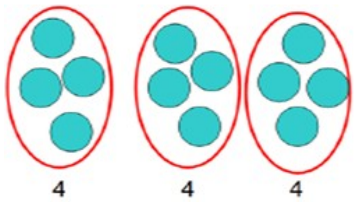
## Stage 1 Group and share small quantities

Using objects, diagrams and pictorial representations to solve problems involving **both grouping and sharing**.

How many groups of 4 can be made with 12 stars? = **3**

**Grouping:**

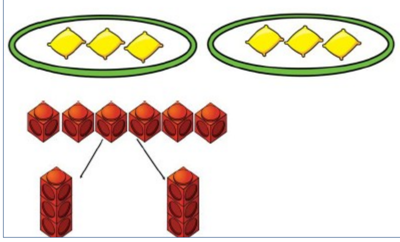
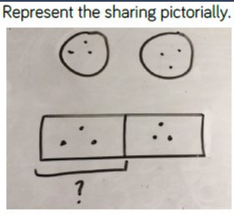
**Sharing:**




12 shared between 3 is 4

**Pupils should :**

- use lots of practical apparatus, arrays and picture representations
- Be taught to understand the difference between 'grouping' objects (How many groups of 2 can you make?) and 'sharing' (Share these sweets between 2 people)
- Be able to count in multiples of 2s, 5s and 10s.
- Find **half** of a group of objects

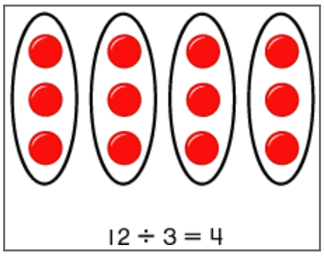
| Concrete | Pictorial | Abstract |
|---|---|---|
| Sharing using a range of objects.<br>6 ÷ 2<br> | Represent the sharing pictorially.<br> | 6 ÷ 2 = 3<br>\| 3 \| 3 \|<br>Children should also be encouraged to use their 2 times tables facts. |

# Division

## Stage 2 Group and share, using the ÷ and = sign

Use objects, arrays, diagrams and pictorial representations, and grouping on a number line.

**Arrays:**

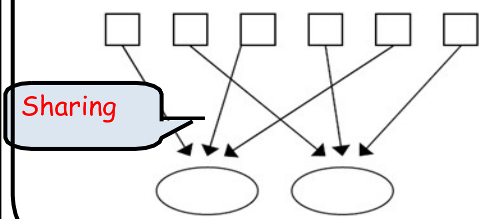



This represents **12 ÷ 3, posed as** how many groups of 3 are in 12?

Pupils should also show that the same array can represent **12 ÷ 4 = 3** if grouped horizontally.

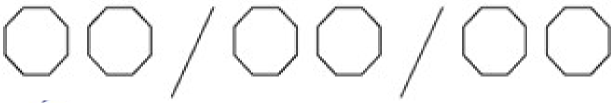
**Know and understand sharing and grouping:**

6 sweets shared between 2 people, how many do they each get?




Grouping

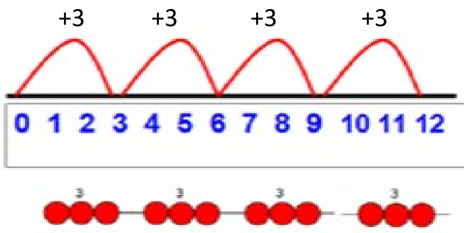
There are 6 sweets, how many people can have 2 sweets each?



Children should be taught to recognise whether problems require sharing or grouping.

**Grouping using a number line:**

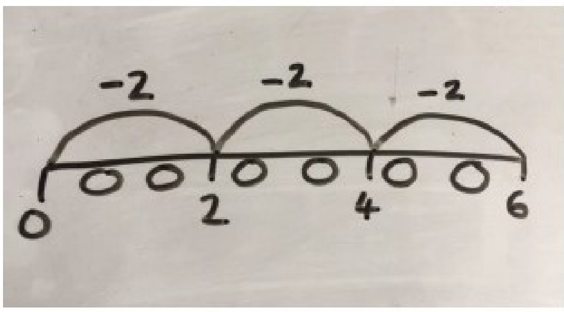
Group from zero in equal jumps of the divisor to find out 'how many groups of _ in _ ?'. Pupils could and using a bead string or practical apparatus to work out problems like 'A CD costs £3. How many CDs can I buy with £12?' **This is an important method to develop understanding of division as grouping.**



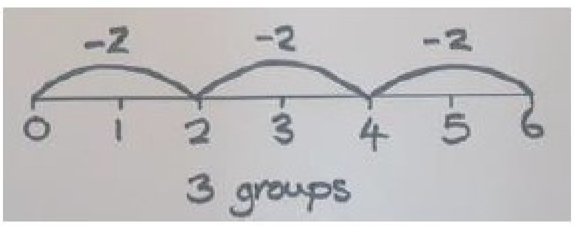

**12 ÷ 3 = 4**

Pose 12 ÷ 3 as '**How many groups of 3 are in 12?**'

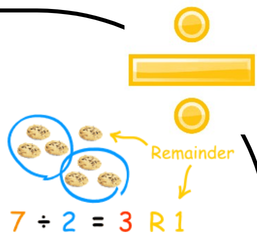
Children to represent repeated subtraction pictorially.



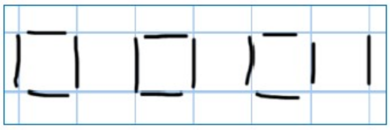
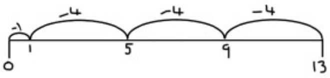
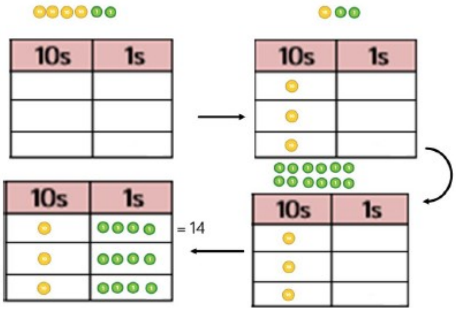
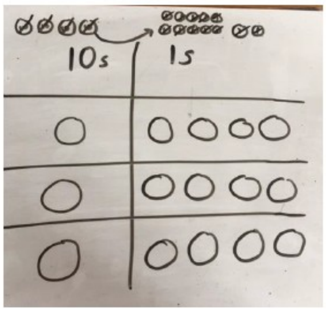

Abstract number line to represent the equal groups that have been subtracted.



# Division

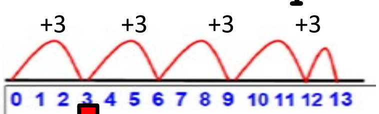



## Stage 3 Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)

| | | |
|---|---|---|
| 2d ÷ 1d **with remainders** using lollipop sticks. Cuisenaire rods, above a ruler can also be used.<br>13 ÷ 4<br><br>Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.<br><br>There are 3 whole squares, with 1 left over. | Children to represent the lollipop sticks pictorially.<br><br>There are 3 whole squares, with 1 left over. | 13 ÷ 4 – 3 remainder 1<br><br>Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.<br><br>'3 groups of 4, with 1 left over'<br> |
| Sharing using place value counters.<br>42 ÷ 3 = 14<br> | Children to represent the place value counters pictorially.<br> | Children to be able to make sense of the place value counters and write calculations to show the process.<br><br>42 ÷ 3<br>42 = 30 + 12<br>30 ÷ 3 = 10<br>12 ÷ 3 = 4<br>10 + 4 = 14 |

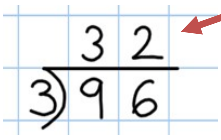
Grouping on a number line:

**13 ÷ 3 = 4 r 1**

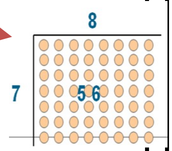



**STEP 1: Children continue to work out unknown division facts by grouping on a number line from zero.** They are also now taught the concept of **remainders**, as in the example. This should be introduced practically and with arrays, as well as being translated to a number line. Children should work towards calculating some basic division facts with remainders mentally for the 2s, 3s, 4s, 5s, 8s and 10s, ready for 'exchanging' remainders across within the short division

Short division: Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the




**STEP 2:** Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array.

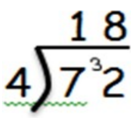



**Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:**

- *How many 3's in 9? = 3, and record it above the **9 tens**.*
- *How many 3's in 6? = 2, and record it above the **6 ones**.*

They could first be asked to use a number line to work this out, highlighting the

Short division: Limit numbers to NO remainders in the final answer, but with remainders occurring within the calculation to be carried to the next digit.



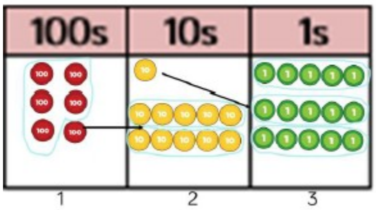
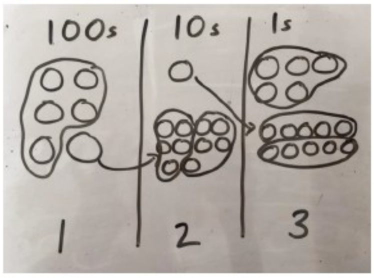

**STEP 3:** Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 96÷4), and be taught to 'carry' the remainder onto the next digit. **If needed, children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.**

Step 3 Only taught when pupils can calculate **'remainders'**.

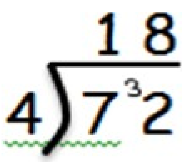
# Division

Real life contexts need to be used routinely to help pupils gain a full understand-ing, and the ability to recognise the place of division and how to apply it to problems.

## Stage 4 Divide up to 3-digit numbers by a single digit (without remainders initially)

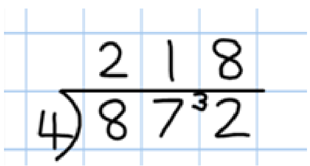
| Short division using place value counters to group.<br>615 ÷ 5 | Represent the place value counters pictorially. |
| --- | --- |
| <br>1. Make 615 with place value counters.<br>2. How many groups of 5 hundreds can you make with 6 hundred counters?<br>3. Exchange 1 hundred for 10 tens.<br>4. How many groups of 5 tens can you make with 11 ten counters?<br>5. Exchange 1 ten for 10 ones.<br>6. How many groups of 5 ones can you make with 15 ones? |  |

Short division should only be taught once children have secured the skill of calculating

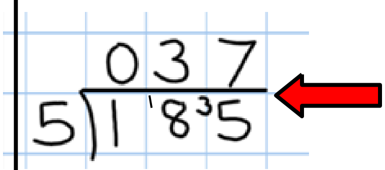


**STEP 1:** Pupils must be secure with the process of short division for dividing 2-digit numbers by a single digit (**those that do not result in a final remainder** — see steps in STAGE 3), but must understand how to calculate remainders, using this to 'carry' remainders within the calculation process (see example).

## Continue to develop short division:



**STEP 2:** Pupils move onto dividing numbers with up to **3-digits** by a single digit, however problems and calculations provided should **not result in a final answer with remainder** at this stage. Children who exceed this expectation may progress to stage 5 level.



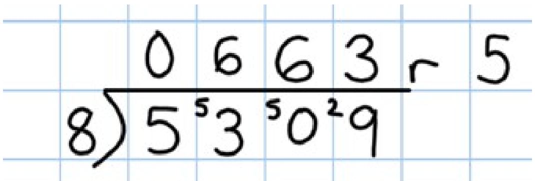
When the answer for the **first column** is zero (1 ÷ 5, as in example), children could initially write a zero above to acknowledge its place, and must always 'carry' the number (1) over to the next digit as a remainder.

Include money and measure contexts when confident.

# Division

**Stage 5** **Divide up to 4 digits by a single digit,** including those with remainders.

Short division, including remainder answers:




**Short division with remainders:** Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and how to express it,** ie. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem.

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.

See stage 6 for how to continue the short division to give a decimal answer for children who

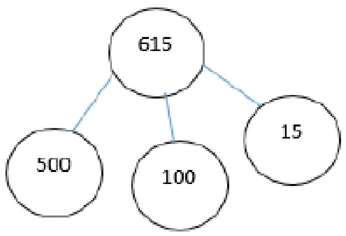
Approximate,
Calculate,
Check it mate!

## Variation in Division

Children should be given frequent opportunities for variation in how problems are presented or, in how they may be expected to solve them. An ability to solve problems in a variety of ways develops Maths Mastery.

These examples are taken from the White Rose calculation policy showing different ways to ask children to solve 615/5 (but is equally applied to larger values):

Using the part whole model below, how can you divide 615 by 5 without using short division?




I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

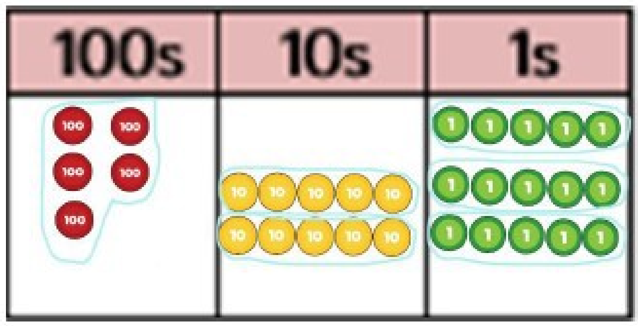
Include money and measure contexts.

5 | 615

615 ÷ 5 =

☐ = 615 ÷ 5

What is the calculation?
What is the answer?



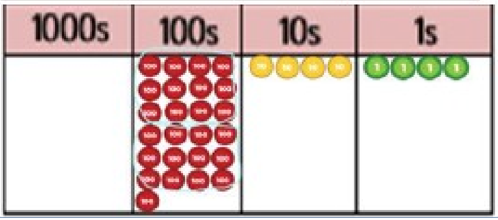
# Division

**Stage 6** **Divide at least 4 digits by both single-digit and 2-digit numbers** (including decimal numbers and quantities)

Long division using place value counters

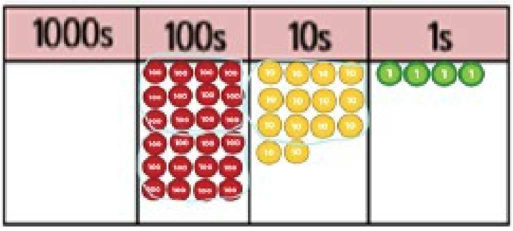
2544 ÷ 12


We can't group 2 thousands into groups of 12 so will exchange them.



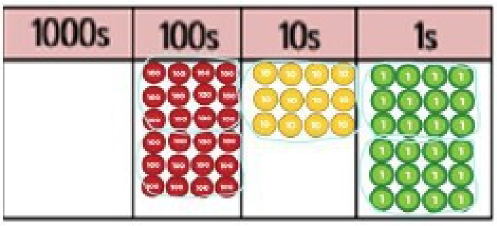

We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

```
   0 2
12|2544
   24
    1
```




After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

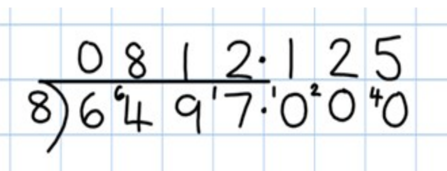
```
   0 2 1
12|2544
   24
    14
    12
     2
```




After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

```
   0 2 1 2
12|2544
   24
    14
    12
     24
     24
      0
```

Short division, for dividing by a single digit: e.g. 6497 ÷ 8




**Short division with remainders:** Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.

**Calculating a decimal remainder:** In this example, rather than expressing the remainder as **r 1**, a decimal point is added after the ones because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.

# Division

Quotient

Divisor | Dividend

## Stage 6 continued...

### Introduce long division for dividing by 2 digits.

| | | | | | |
|---|---|---|---|---|---|
| 3 | 6 | 9 | 7 | 2 | |

1. If the divisor is bigger than 12 then list the multiples of that number by doubling etc. e.g.
   1x = 36
   2 x = 72
   3 x = 108
   4 x = 144
   5 x = 180
2. Set out the calculation as in the 'bus stop method'
3. Look at the largest column of the dividend and see if that column is divisible by the divisor (e.g. 9 in the example here). If not, use the next column to help (e.g. 7 in the example here – looking at this number as if it is now 97).
4. Place the total number of groups that you get from this calculation (e.g. 97÷36= 2 groups, with a remainder of 25)
5. Multiply the total number of groups in step 4 by the divisor (e.g. 2 x 36=72) and write the answer underneath the first two columns.
6. Subtract the 72 from the 97 to show the remainder – lining the remainder up underneath.
7. Of the dividend, you will have one or more unused digits (number 2 in the example) which you bring down next to the remainder (25) to create the new number "252". This number now becomes the dividend and you now see how many groups of the divisor go into that group.

| | | | | |
|---|---|---|---|---|
| | | 0 | 2 | 7 |
| 3 | 6 | 9 | 7 | 2 |
| | | 7 | 2 | ↓ |
| | | 2 | 5 | 2 |

Must be aligned in place value for subtracting.

| | | | | | | |
|---|---|---|---|---|---|---|
| | £ | 0 | 2 | . | 3 | 5 |
| 3 | 2 | 7 | 5 | . | 2 | 0 |
| | - | 6 | 4 | | ↓ | |
| | | 1 | 1 | | 2 | |
| | - | | 9 | | 6 | ↓ |
| | | | 1 | | 6 | 0 |

Step 7 (above) may be repeated several times depending on the number of digits in the dividend and the context of the problem. If it is money/a decimal problem, columns of zeros may be needed to bring down. You will be left with a single digit remainder, depending on the contexts of the problem (as in the example here).

When dropping down digits to join the remainder, treat this as a whole number—ignoring the decimal for this part of the problem but ensuring it remains in the bus stop (i.e. the decimal must remain in the quotient and dividend line)

**The following acronym may help with remembering which steps to take in long division problems**

Dad → **D = Divide**
Mother → **M = Multiply**
Sister → **S = Subtract**
Brother → **B = Bring down**

# Key Vocabulary

Within each stage, children should always be taught to extend earlier vocabulary with the additional vocabulary related to their stage.

## Addition

| | |
|---|---|
| Early Stage | add, one more, count, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line |
| Stage One | Use and apply language from the Early Stage in a range of contexts |
| Stage Two | sum, tens, ones, partition, addition, column, tens boundary |
| Stage Three | hundreds boundary, increase, vertical, 'carry', expanded, compact |
| Stage Four | thousands, hundreds, digits, inverse |
| Stage Five | decimal places, decimal point, tenths, hundredths, thousandths |
| Stage Six | Use and apply language from stage five in a range of contexts. |

## Subtraction

| | |
|---|---|
| Early Stage | Take, take away, less, minus, subtract, leaves, most, least, count back , how many left? |
| Stage One | Equal to, distance between, how many more, how many fewer / less than, how much less is_? |
| Stage Two | difference, count on, strategy, partition, tens, ones |
| Stage Three | exchange, decrease, hundreds, value, digit |
| Stage Four | inverse |
| Stage Five | tenths, hundredths, decimal point, decimal |
| Stage Six | Use and apply language from stage five in a range of contexts. |

# Key Vocabulary

Within each stage, children should always be taught to extend earlier vocabulary with the additional vocabulary related to their stage.

## Multiplication

| | |
|---|---|
| Early Stage | double, count, altogether, two groups, twice, the amount same again, repeat, more, patter |
| Stage One | groups of, lots of, times, array, altogether, multiply, count |
| Stage Two | multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times.. |
| Stage Three | partition, grid method, multiple, product, tens, ones, value |
| Stage Four | inverse |
| Stage Five | square, factor, integer, decimal, short/long multiplication, 'carry |
| Stage Six | tenths, hundredths, decimal |

## Division

| | |
|---|---|
| Early Stage | share, share equally, one each, two each…, half, split, same, fair, even,<br>halving, sharing |
| Stage One | share, share equally, one each, two each…, group, groups of, lots of, array |
| Stage Two | divide, divided by, divided into, division, grouping, number line, left, left over |
| Stage Three | inverse, short division, 'carry', remainder, multiple |
| Stage Four | divisible by, factor |
| Stage Five | quotient, prime number, prime factors, composite number (non-prime) |
| Stage Six | common factor |

# Five Steps towards Reasoning

Reasoning means thinking about a mathematics beyond simply solving a problem or providing an answer. It is this reasoning that provides pupils with an opportunity to understand mathematics in depth. It is also an essential element of 'mastering' maths; as pupils are encouraged to communicate their understanding with increasing fluency.

The following steps towards reasoning have been taken from the NRICH article: Reasoning*: the Journey from Novice to Expert*.

***Step one*:** Describing: simply tells what they did.

***Step two*:** Explaining: offers some reasons for what they did. These may or may not be correct. The argument may yet not hang together coherently. This is the beginning of inductive reasoning.

***Step three*:** Convincing: confident that their chain of reasoning is right and may use words such as, 'I reckon' or 'without doubt'. The underlying mathematical argument may or may not be accurate yet is likely to have more coherence and completeness than the explaining stage. This is called inductive reasoning.

***Step four*:** Justifying: a correct logical argument that has a complete chain of reasoning to it and uses words such as 'because', 'therefore', 'and so', 'that leads to' ...

***Step five*:** Proving: a watertight argument that is mathematically sound, often based on generalisations and underlying structure. This is also called deductive reasoning.

*NRICH*
*https://nrich.maths.org/11336?fref=gc&dti=784198881679399*

Opportunities for reasoning should be made possible throughout all work on calculations. Consequently, these steps have been added to this calculation policy and are expected as a part of teaching and learning. By the end of Year 6 children should be working at at least Stage 4 for 'Greater Depth'.

# Times Tables Expectations

Rapid recall of times table facts will help children across all aspects of the Mathematics National Curriculum. In addition, rapid recall of times able facts are a fundamental part of children's ability to work fluently.

***'By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.'***

National Curriculum, 2014

**The requirements for Year groups are as follows:**

**Year 1** – counting in 2s, 5s and 10s

**Year 2** - recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

**Year 3** – recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

**Year 4** - recall multiplication and division facts for multiplication tables up to 12 × 12

**Year 5** - they apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.

In this calculations policy, year groups are referred to as 'stages'. This is because it is important that children are confident working at each stage before moving on. However, the National Curriculum provides expectations for pupils at the end of each year group (as above for times tables).

# Times Table Certificates

Times tables tests will be carried out weekly from Year 2 onwards.

The learning of times tables should be part of lessons as appropriate, but also encouraged at home.

Times tables are taught/tested in the following order:

2, 10, 5, 3, 11, 9, 4, 8, 6, 7, 12

The test should be applied using the school format. Children must know the number facts by rote and should not be given time in the test to use other mental calculation strategies. Once they have successfully scored 12/12 in a test on 3 occasions they can move to the next one. After completing all 12 times tables, the children will have a weekly sheet that tests all multiplication and division facts within them.

To motivate the children to learn their multiplication tables an award system has been designed. This involves levels of progression linked to medal certificates.

* **Bronze Award:** Completed 2's, 5's and 10's
* **Silver Award:** Completed 3's, 4's, 9's and 11's
* **Gold Award:** Completed 6's, 7's, 8's and 12's