In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them.
Encourage children to choose to use the most efficient method for the numbers and the context. Teach operations together to emphasise the importance of inverse.

Addition to be taught alongside each other Subtraction

Multiplication to be taught alongside each other Division

Y3

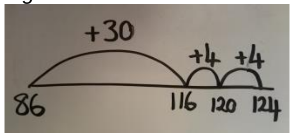
Addition

Children will continue to use empty number lines with increasingly larger numbers and will begin to use informal methods (jottings) to support, record and explain partial mental methods, building on existing mental strategies.

Counting on

Count on from the largest number irrespective of the order of the calculation. Bridge through tens and begin to bridge through 100s.

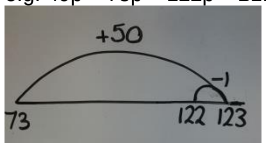
e.g. 38 + 86 = 124



Compensation

(For near multiples of 10)

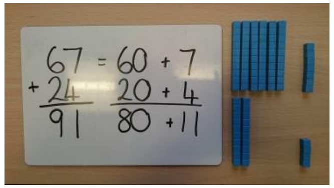
e.g. 49p + 73p = 122p = £1.22



Expanded informal method using place value

Introduce practically, using Base 10 or place value counters. Encourage children to use equipment and informal methods when the calculation can't be done mentally. Model first with simpler numbers which they can solve mentally.

Model expanded horizontal partitioning using Base 10 or place value counters.



243 = 200 + 40 + 3
+435 = 400 + 30 + 5
678 = 600 + 70 + 8S

Formal written method:

As the children develop their understanding of the informal method, this will lead into

Subtraction

Children will continue to use empty number lines with increasingly large numbers and will begin to use informal methods (jottings) to support, record and explain partial mental methods, building on existing mental strategies.

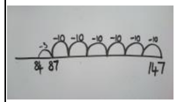
Counting back

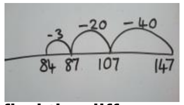
Subtracting the tens in one jump and the units in one jump (focus on efficiency e.g. challenge children to solve subtraction calculations in two steps) 147 -23

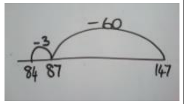
147 - 20 = 127 127 - 3 = 124

Bridging through ten can help children become more efficient.

e.g. 147 – 63







Counting on to find the difference

Use real life contexts such as height, length etc.

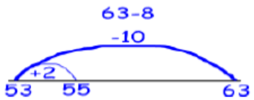
e.g. I am 123cm tall. My brother is 98cm tall. How much taller am I?

98 + ☐ = 123 ☐ = 123 – 98

When the numbers involved are close together or near to multiples of 10 or 100, counting on with a number line can be used, alongside resources such as bead bars.

Compensation (for near multiples of 10)

63 - 8 = 55



Expanded informal method using place value

67 – 24

67 = 60 + 7
-24 -20 + 4
43 = 40 + 3

Introduce practically, using Base 10 or place value counters. Develop into 3 digit - 2 digit numbers. Partition 3 digit numbers into ways that are helpful for the subtraction.

e.g. 325 - 58 = 325 - 25 - 25 - 5 - 3 = 267

Or 325 - 58 = 267 so 325 becomes 200 + 110 + 15
- 50 - 8
200 + 60 + 7

Formal written method:

Multiplication

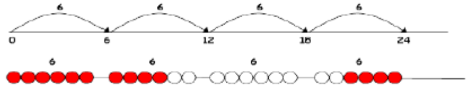
Children will continue to use:

Repeated addition

6 multiplied by 4 = 6 x 4 = 6 'four times'

4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6

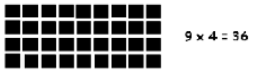
Children should use number lines or bead bars to support.



Arrays

Increasingly use arrays to make links between x and ÷.

Children should model a multiplication calculation using an array. This knowledge will support the development of the grid method.



4 x 9 = 36 36÷ 9 = 4 36 ÷ 4 = 9

It is important for teachers to be consistent. Either seen as a row of 9, 4 times (9 x 4)... or a column of 4, 9 times (4 x 9). Both are correct

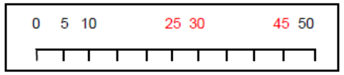
Moving towards 2 digit x 1 digit using place value.

90 x 4 = 40 x 9 = 360 360 ÷ 9 = 40 360 ÷ 4 = 90

Derive facts from known facts

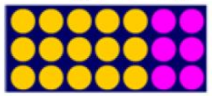
Use number line to show known multiplication facts and then derive unknown facts.

e.g. If you know 5 x 10 = 50. Count back 5 to derive 5 x 9 etc. 5 x 5 will be half of 5 x 10 etc... Relate to other 'tables'.



Also, partition an array to show how to derive an unknown fact from a known fact e.g. use knowledge of 2 and 5 times tables to work out multiples of 7, e.g. 7 x 3 = 5 x 3 + 2 x 3

15 + 6 = 21



Scaling

Use Base 10 equipment to show 10 times bigger / smaller. Model the enlargement.

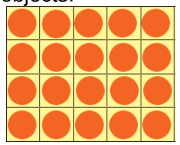
e..g to show why 6 x 3 helps in solving 60 x3.

Find a ribbon that is 4 times as long as the blue ribbon r = b x 4

Division

Ensure that the emphasis in Y3 is on grouping rather than sharing, except when using fractions as this is sharing.

Children will continue to use arrays to group objects:



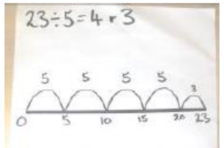
20 ÷ 5 = 4
20 ÷ 4 = 5

Number lines and known multiplication facts to solve division following on from repeated addition.

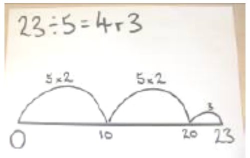
Use number lines and known multiplications to solve divisions incl. with **remainders**.

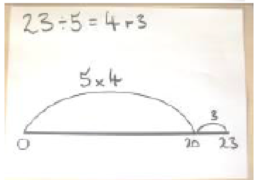
Move into chunking (grouping) using these steps. Encourage children to be as efficient as possible.

23 ÷ 5 = 4 r3



Moving towards more efficient approaches, using known facts.





Using symbols to stand for unknown numbers to complete equations using inverse operations (2 digit ÷ 1 digit numbers)

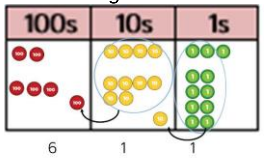
26 ÷ 2 = ☐ 24 ÷ △ = 12 ☐ ÷ 10 = 8

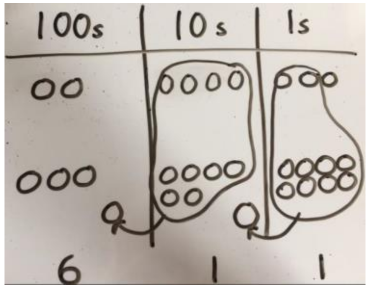
Find unit fractions of numbers and quantities

Start to relate fractions to division in context:

In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them.
Encourage children to choose to use the most efficient method for the numbers and the context. Teach operations together to emphasise the importance of inverse.

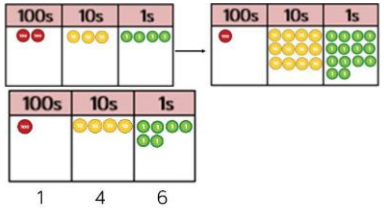
using the standard written method, using appropriate exchanges:

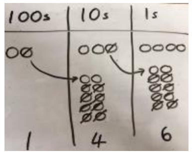





```
 243
+368
 611
 1 1
```

As the children develop their understanding of the informal method, this will lead into using the standard written method, with exchanges:



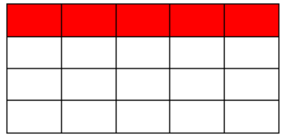


$$\begin{array}{r} {}^{2}\ \ {}^{1} \\ 2\cancel{3}4 \\ -\ \ 88 \\ \hline 146 \\ \hline \end{array}$$

Using symbols to stand for unknown numbers to complete equations using inverse operations.
☐ x 5 = 20   3 x △ = 18   ☐ x △ = 32

Partitioning (2 digit x 1 digit number)
38 x 5 = (30 x 5) + (8 x 5) = 150 + 40 = 190

e.g. A cake recipe for 8 people uses 500g of flour. How much flour would I need to make a cake for 4 people?
What is ½ ⅓ ¼ ⅙ of 12 litres or ¼ of 20 kg?



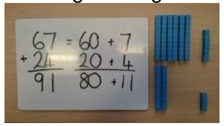
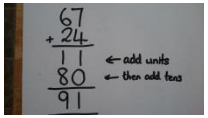
In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them.
Encourage children to choose to use the most efficient method for the numbers and the context. Teach operations together to emphasise the importance of inverse.

Y4

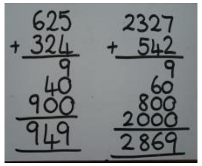
Addition to be taught alongside each other Subtraction

Addition

Expanded informal method
Model expanded horizontal partitioning with Dienes leading to compact vertical method working from right to left.

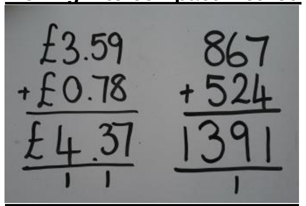



Moving quickly into 3 or 4 digit numbers for calculations that are hard to solve mentally.



Model how solving an addition on empty number line increasingly becomes less efficient as the complexity and size of numbers increases.

Moving into compact method



Compensation
Continue to teach compensation method where children round and adjust to the nearest 10/100, especially in the context of money.

£4.99 + £6.99 = £5.00 – 1p + £7.00 – 1p = £12.00 – 2p = £11.98

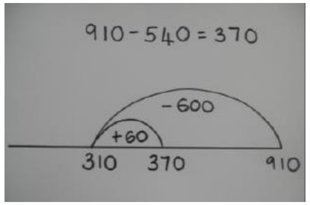
Using similar methods, children will:
- ✓ add several numbers with different numbers of digits
- ✓ begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds
- ✓ know that the decimal points should line up under each other, particularly when adding or subtraction mixed amounts, e.g. £3.59 + 78p

Subtraction

Difference by counting on (See Y3) For numbers close together
e.g. 102 – 89 = 13

Including measures
e.g. 754ml – 690ml *or* 1275g – 786g *or* £3.00 - £2.68

Counting back and compensation
When appropriate (using number lines) bridging through 10, 100 and 1000 and rounding and adjusting (compensating) e.g. 42p – 5p *or* 193 litres – 18 litres *or* £823 - £32 *or* 706 mins – 28 mins *or* 307cm – 111cm *or* 1006km – 9km

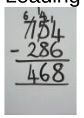


Expanded horizontal (including 4 digit numbers) using Dienes should be modelled to help children to understand decomposition.

Step 1	754 – 286	=	700 + 50 + 4 - 200 + 80 + 6
Step 2			700 + 40 + 14 - 200 + 80 + 6 *(adjust from T to U)*
Step 3			600 + 140 + 14 - 200 + 80 + 6 400 + 60 + 8 = 468 *(adjust from H to T)*

754 = 700 + 50 + 4 = 700 + 40 + 14 = 600 + 140 + 14
- 200 80 6
400 60 8

Leading to formal column method



Children should:
- ✓ be able to subtract numbers with different numbers of digits
- ✓ begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds
- ✓ solve with increasing efficiency using only two steps

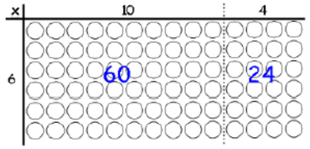
Multiplication to be taught alongside each other Division

Multiplication

2 and 3 digit x 1 digit numbers. Include x 0 and x 1
Partitioning using place value and the distributive law

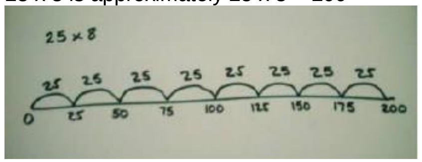
38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

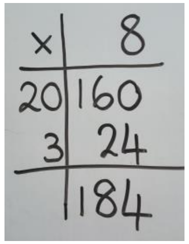
Children will continue to use arrays where appropriate leading into the grid method of multiplication.

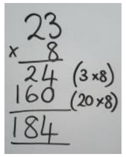


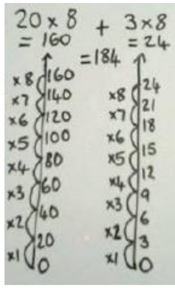
(10 x 6) + (4 x 6)
60 + 24
= 84

Grid method
Multiplication by a single digit.
Children should approximate first
23 x 8 is approximately 25 x 8 = 200









Formal Written Method:

As, children develop their knowledge of informal methods, they will be introduced to the formal written method:

6 x 23 =

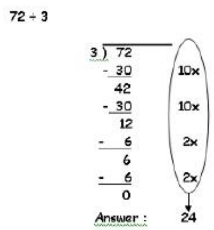
$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline {\scriptstyle 1\ 1} \end{array}$$

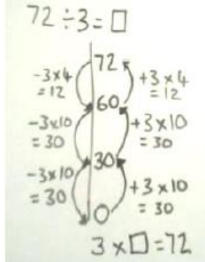
Division

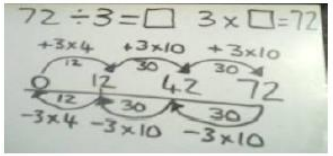
2 and 3 digit ÷ 1 digit numbers. Include ÷ 0 and ÷ 1

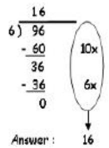
Number lines and known multiplication facts to solve division
Children will continue to develop their use of number lines and known multiplication facts to solve division calculations (using known multiples of the divisor). Initially, these should be multiples of 10, 5, 2 and 1 – numbers with which the children are more familiar, moving on to 3s, 4s and 8s.

Short division (2 digit ÷ 1 digit numbers)
Illustrate using horizontal and vertical bead bar and number line to make link between vertical column method.
Expanded written method:

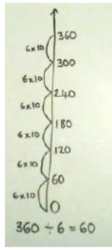


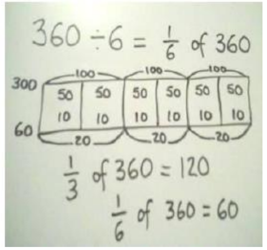






Using knowledge of place value, known facts and fractions
360 ÷ 6 = 60   6 x 10 x 6 or 6 x 6 x 10 or 6 x 60 = 360





Children need to make sensible decisions about rounding up or down after division. Any

In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them.
Encourage children to choose to use the most efficient method for the numbers and the context. Teach operations together to emphasise the importance of inverse.

			<u>Recognise and use factor pairs</u> 21 x 8 = 7 x 3 x 2 x 4 = 168 **<u>Multiply 3 single digits together</u>** e.g. 3 x 4 x 5	remainders should be shown as integers, e.g. 44 ÷ 3 = 14 remainder 2 or 14 r2 **<u>Formal Written Method:</u>** As, children develop their knowledge of informal methods, they will be introduced to the formal written method: $\begin{array}{r} 123 \\ 5\overline{)6^{1}1^{1}5} \end{array}$