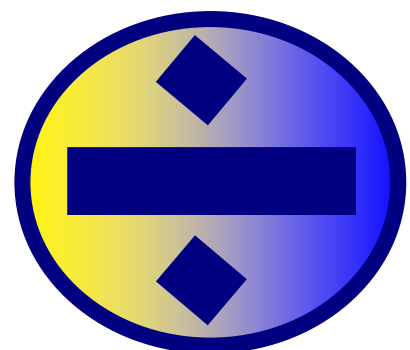
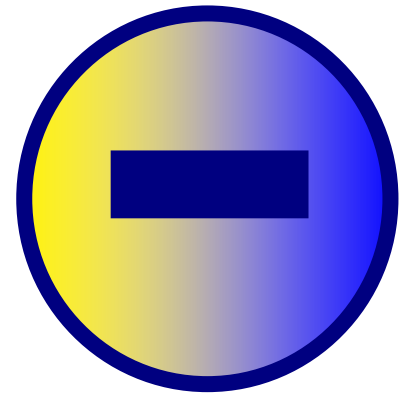
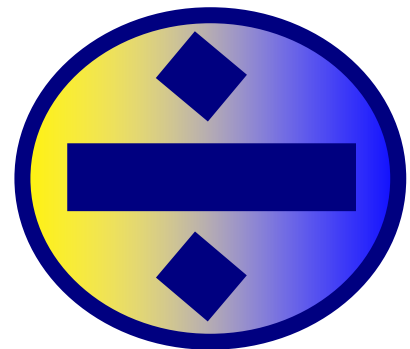
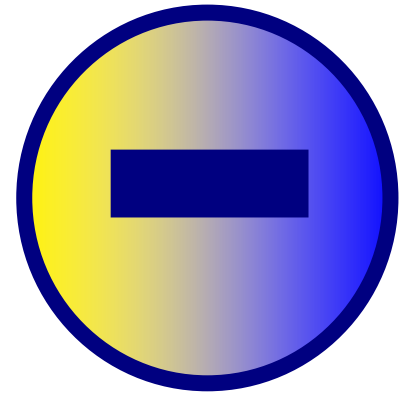


Whitgreave Primary Schools



Maths Leader = Alex Albutt
Calculations Policy and Guidelines 2018
Addition Pathway

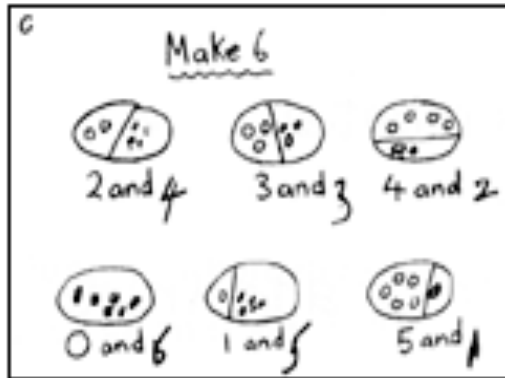


This document is designed to show the whole school progression of Calculation Strategies. Please refer to the School Curriculum Maps and Learning Ladders to see how calculation strategies can be effectively used across mathematical concepts.

ADDITION

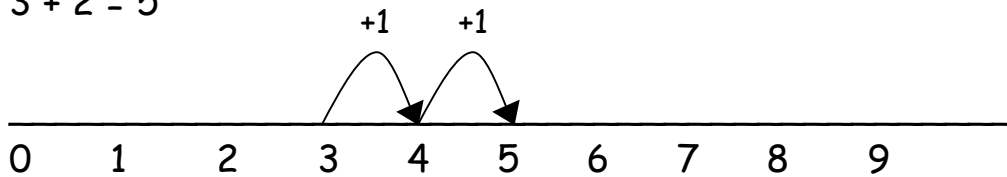
Year 1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



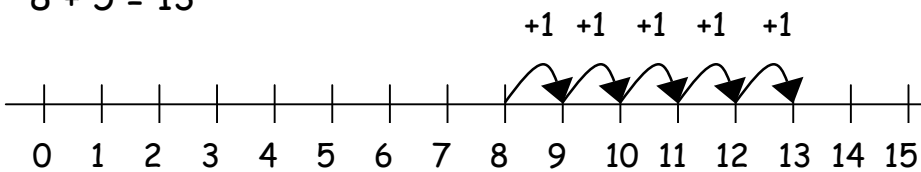
They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.

$$3 + 2 = 5$$

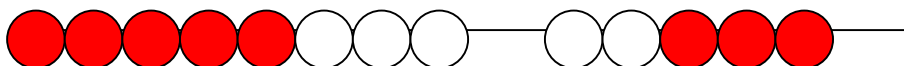


Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

$$8 + 5 = 13$$



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



Year 2

Children will now move on to;

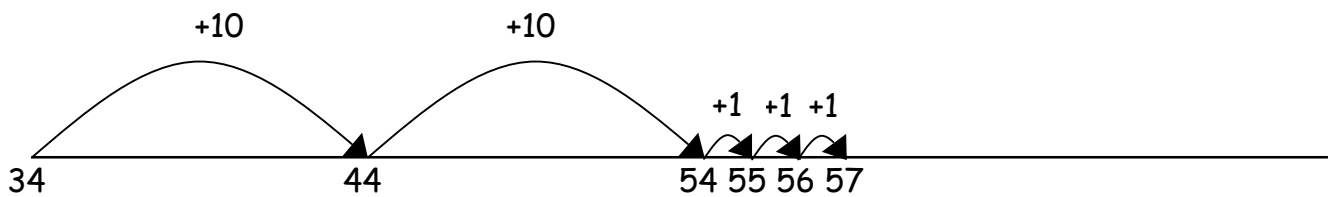
- TU + U
- TU + x10

This should be demonstrated using empty number lines as demonstrated below.

Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

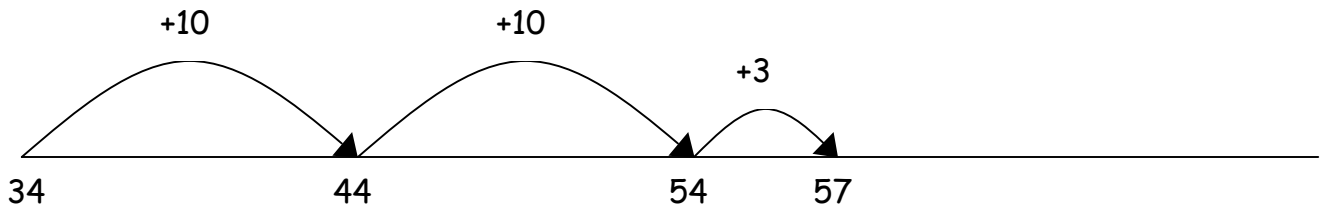
- ✓ First counting on in tens and ones.

$$34 + 23 = 57$$



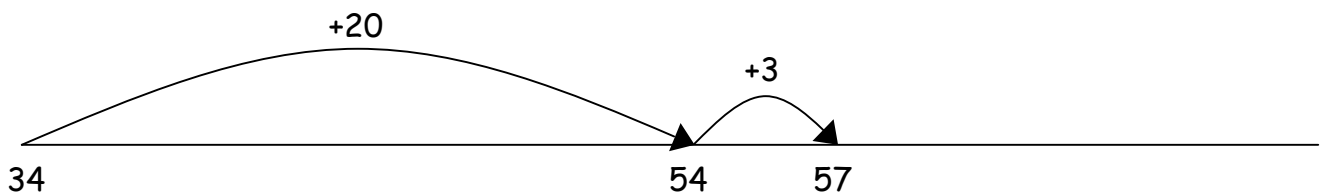
- ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact $4 + 3 = 7$).

$$34 + 23 = 57$$



- ✓ Followed by adding the tens in one jump and the units in one jump.

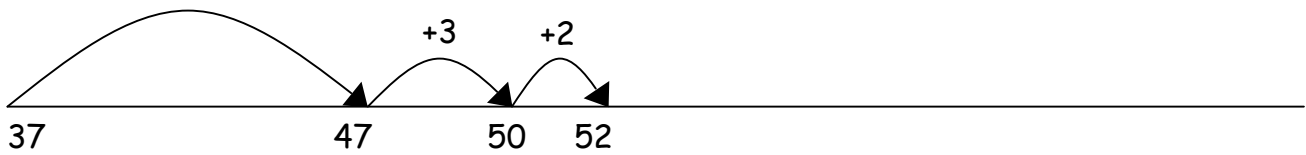
$$34 + 23 = 57$$



- ✓ Bridging through ten can help children become more efficient.

$$37 + 15 = 52$$

+10



✓ Adding ten and then compensating when adding 9, 11, 19, 21, etc.

$$36 + 9 = 45$$

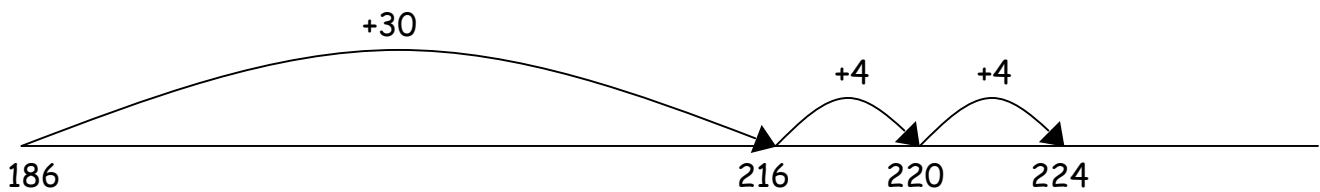


Year 3

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

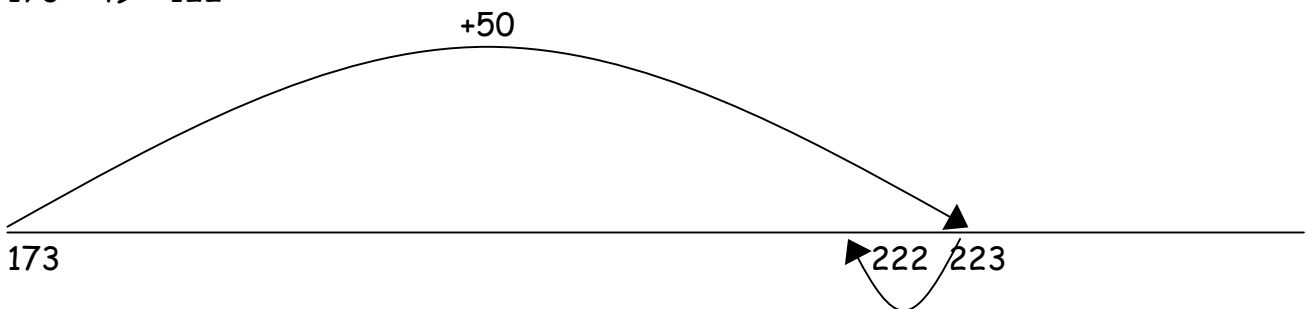
✓ Count on from the largest number irrespective of the order of the calculation.

$$38 + 186 = 224$$

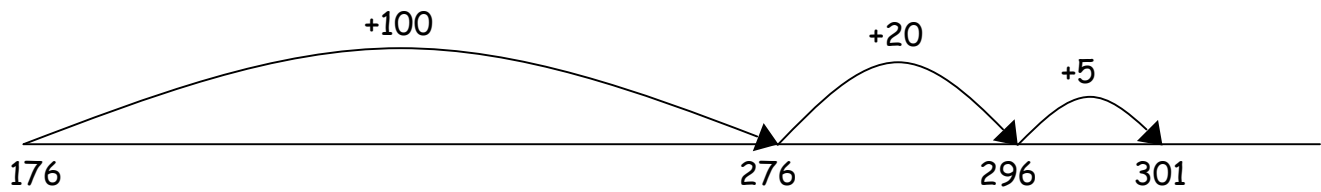


✓ Compensation.

$$173 + 49 = 222$$



$$125 + 176 = 224$$



Children will begin to use informal pencil and paper methods (jottings) to support record and explain partial mental methods building on existing mental strategies.

By the end of Year 3, children should begin to work on formal extended column addition methods.

$$\begin{array}{r}
 625 \\
 + 148 \\
 \hline
 773
 \end{array}
 \rightarrow
 \begin{array}{r}
 600 \\
 + 100 \\
 \hline
 700
 \end{array}
 \rightarrow
 \begin{array}{r}
 20 \\
 + 40 \\
 \hline
 60
 \end{array}
 \rightarrow
 \begin{array}{r}
 5 \\
 + 8 \\
 \hline
 13
 \end{array}
 \quad 700+60+13 = 772$$

This would be recorded by the children like below to build on the concept of place value.

$$\begin{array}{r}
 625 \\
 + 148 \\
 \hline
 700 \text{ (600+100)} \\
 60 \text{ (20+40)} \\
 13 \text{ (5+8)} \\
 \hline
 773
 \end{array}
 \qquad
 \begin{array}{r}
 783 \\
 + 142 \\
 \hline
 800 \text{ (700+100)} \\
 120 \text{ (80+40)} \\
 5 \text{ (3+2)} \\
 \hline
 925
 \end{array}$$

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 subtracting mixed amounts, e.g. £3.59 + 78p.*
- ✓ *estimate answers by approximating.*
- ✓ *use inverse operations to check answers.*

Year 4

In Year 4, children should work with larger number (4-digits). Including numbers with decimals.

$$\begin{array}{r} 1587 \\ + 1475 \\ \hline 2000 \text{ (1000 + 1000)} \\ 900 \text{ (500+400)} \\ \textcircled{150} \text{ (80+70)} \\ \textcircled{12} \text{ (5+7)} \\ \hline 3062 \end{array}$$
$$\begin{array}{r} \text{£}6.75 \\ + \text{£}5.87 \\ \hline 11.00 \text{ (6.00 + 5.00)} \\ \textcircled{1.50} \text{ (0.80+0.70)} \\ \textcircled{0.12} \text{ (0.07+0.05)} \\ \hline 12.62 \end{array}$$

Using similar methods, children will:

- ✓ add several numbers with different numbers of digits;
- ✓ begin to add two or more decimal numbers in relation to money.
- ✓ to solve problems when adding mixed £ and p by converting between them.
- ✓ estimate answers by approximating.
- ✓ use inverse operations to check answers.

Year 5

In Year 5, children should be able to add numbers with more than 4 digits using formalised written methods. Children should now work with a range of whole and mixed numbers with a range of decimal places.

$$\begin{array}{r} 21587 \\ + 13475 \\ \hline 30000 \\ 4000 \\ 900 \\ \textcircled{150} \\ \textcircled{12} \\ \hline 35062 \end{array}$$
$$\begin{array}{r} 167.5 \\ + 58.7 \\ \hline 100.0 \\ \textcircled{110.0} \\ \textcircled{15.0} \\ \textcircled{1.2} \\ \hline 226.2 \end{array}$$

➤ As children become confident with the extended formal method, they may wish to save time by not showing working alongside the method.

Moving on to a short formal method

$$\begin{array}{r} 21587 \\ + 13475 \\ \hline 35062 \\ 11 \end{array}$$
$$\begin{array}{r} 167.5 \\ + 58.7 \\ \hline 226.2 \\ 111 \end{array}$$

➤ Children can now use the extended method alongside a short method with carrying. This will give them a visual aid to show how carry is simple the bridged number from the extended method.

Using similar methods, children will:

- ✓ add several numbers with different numbers of digits;
- ✓ begin to add two or more decimal fractions with up to three digits and a mixed number of decimal places;
- ✓ know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m - 280 cm.
- ✓ estimate answers by approximating.
- ✓ use inverse operations to check answers.

Year 6

In Year 6, children work with increasingly larger numbers. Extended methods are now completely replaced with short methods.

$$\begin{array}{r} 764809 \\ + 148685 \\ \hline 913494 \\ \hline 1111 \end{array}$$

$$\begin{array}{r} 40.1 \\ 8.65 \\ \hline 2 \\ \hline 50.75 \\ \hline 1 \end{array} \longrightarrow \begin{array}{r} 40.10 \\ 8.65 \\ \hline 2.00 \\ \hline 50.75 \\ \hline 1 \end{array}$$

➤ Show children how to add place holders to avoid alignment issues.

Using similar methods, children will

- ✓ add several numbers with different numbers of digits;
- ✓ begin to add two or more decimal fractions with up to four digits and either one or two decimal places;
- ✓ know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.

+ - + - + - + - + - + - +

By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

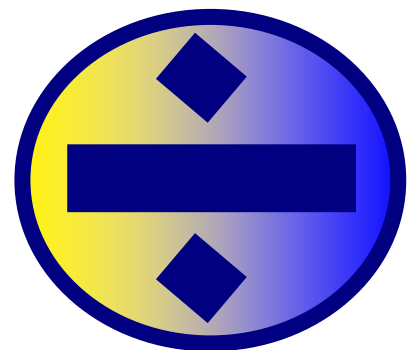
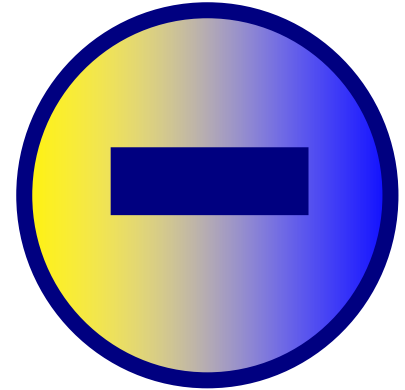
Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Subtraction Pathway



This document is designed to show the whole school progression of Calculation Strategies. Please refer to the School Curriculum Maps and Learning Ladders to see how calculation strategies can be effectively used across mathematical concepts.

SUBTRACTION

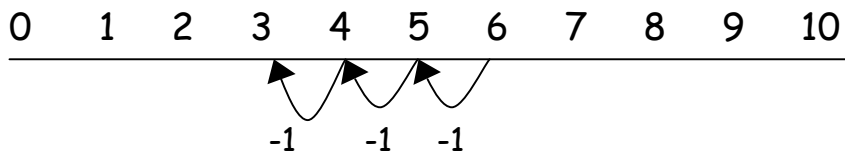
Year 1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.

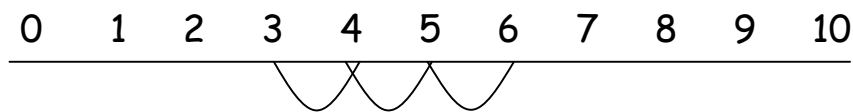


They use number lines and practical resources to support calculation. Teachers *demonstrate* the use of the number line.

$$6 - 3 = 3$$

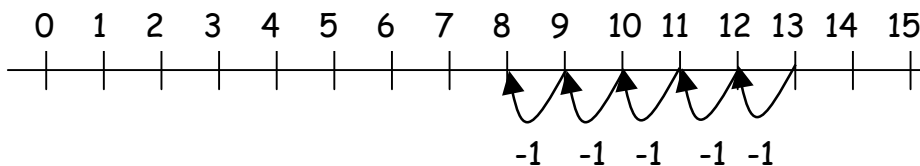


The numberline should also be used to show that $6 - 3$ means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.



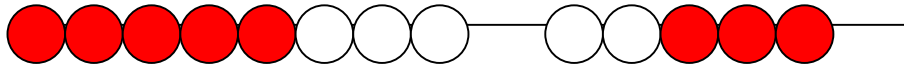
Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones.

$$13 - 5 = 8$$



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

$$13 - 5 = 8$$



By the end of year one, children should know all of their number facts to 20.

Year 2

Children will now move on to;

- TU - U
- TU - x10

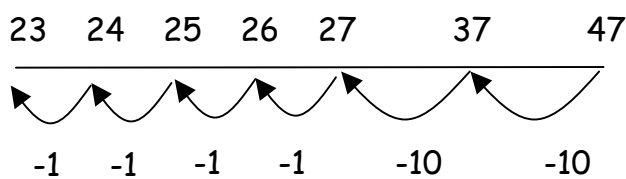
This should be demonstrated using empty number lines as demonstrated below.

Children will begin to use empty number lines to support calculations.

Subtracting using knowledge and understanding of counting forwards and backwards in multiples of 10.

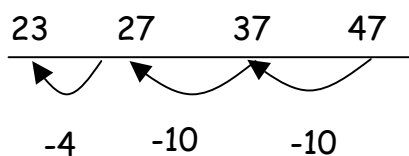
- ✓ First counting back in tens and then ones.

$$47 - 24 = 23$$



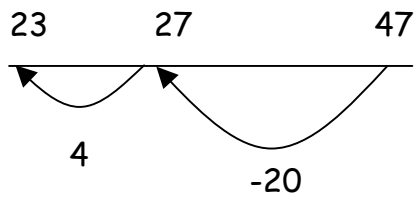
- ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact $7 - 3 = 4$).

$$47 - 24 = 23$$



- ✓ Counting backwards in tens using one jump and the units in one jump.

$$47 - 24 = 23$$



- ✓ Bridging through ten can help children become more efficient.

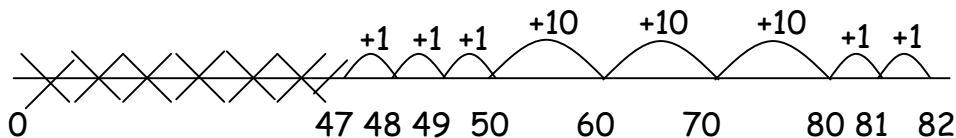
Counting on

If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc, it can be more efficient to count on.

The children may also learn to count up from 47 to 82 in jumps of 10 and jumps of 1.

The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.

$$82 - 47$$



Help children to become more efficient with counting on by:

- ✓ *Subtracting the units in one jump;*
- ✓ *Subtracting the tens in one jump and the units in one jump;*
- ✓ *Bridging through ten.*
- ✓ *They should know that subtraction operations can't be done in any order.*

Year 3

Children will continue to use empty number lines with increasingly large numbers.

Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

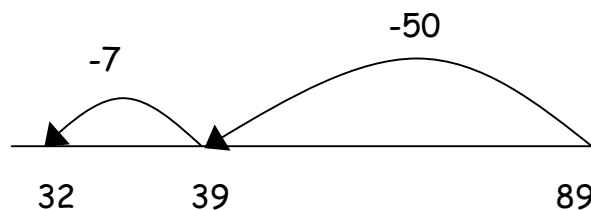
Written methods for the number line

Children at this stage will be ready to move on to written methods. Number lines may still be used to support the workings. This method will also develop mental calculation strategies.

This method can be demonstrated by the teacher as means of introduction.

$$89 - 57 = \underline{\quad}$$

$$\begin{array}{r} 80 \\ - 50 \\ \hline 30 \end{array} + \begin{array}{r} 9 \\ 7 \\ \hline 2 \end{array} = 32$$



Children should know that units line up under units, tens under tens and so on.

Where calculations involve numbers that are close together or near multiples of 10 or 100, counting on using a number line should be used or a mental calculation.

By the end of Year 3, children should move subtraction of three digit numbers and now begin to work solely on extended methods to build their understanding of place value and the idea of exchanging. This will lead into the next step involving decomposition.

$$234 - 86 = 148$$

$$\begin{array}{r} 100 \\ 200 \\ - 0 \\ \hline 100 \end{array} + \begin{array}{r} 120 \\ 30 \\ 80 \\ \hline 40 \end{array} + \begin{array}{r} 14 \\ 6 \\ 8 \\ \hline 8 \end{array} = 148$$

Decimals in relation to money. Should be done in practical contexts.

$$£2.34 - 86p$$

When working with money the children can set the amounts to whole numbers, i.e. £8.95 - £4.38 can become 895 - 438. The children then convert this back to £'s.

$$234 - 86 = 158$$

$$\begin{array}{r} 100 \\ 200 \\ \underline{0} \\ 100 \end{array} + \begin{array}{r} 120 \\ 30 \\ 80 \\ 40 \end{array} + \begin{array}{r} 14 \\ 6 \\ 8 \end{array} = 148$$

$$£2.34 - 86p = £1.48$$

Year 4

In Year 4, children move on to subtracting increasingly larger numbers such as HTU, ThHTU+, and numbers involving decimals where money is concerned.

$$754 - 86 = 668$$

$$\begin{array}{r} 600 \\ 700 \\ \underline{0} \\ 600 \end{array} + \begin{array}{r} 140 \\ 50 \\ 80 \\ 60 \end{array} + \begin{array}{r} 14 \\ 6 \\ 8 \end{array} = 668$$

- In Year 4 children may still use number lines to support the written method.
- Others may be ready to use the extended subtraction method.

$$1826 - 884 = 942$$

$$\begin{array}{r} 0 \\ 1000 \\ \underline{0} \\ 0 \end{array} + \begin{array}{r} 1700 \\ 800 \\ 800 \\ 900 \end{array} + \begin{array}{r} 120 \\ 80 \\ 40 \end{array} + \begin{array}{r} 6 \\ 4 \\ 2 \end{array} = 942$$

Once this concept has been completed, children should then move on to ThHTO - ThHTO using the same method.

Children should now be ready for working with decimals where money is involved.

$$£6.74 - £3.45 = £3.28$$

$$\begin{array}{r} 6.00 \\ 3.00 \end{array} + \begin{array}{r} 0.60 \\ 0.70 \\ 0.40 \end{array} + \begin{array}{r} 0.14 \\ 0.04 \\ 0.06 \end{array}$$

- Children should avoid converting numbers and work with the decimals given (unless p and £ are mixed).
- Where exchanging occurs with decimals, replace the whole number by crossing out and writing the new

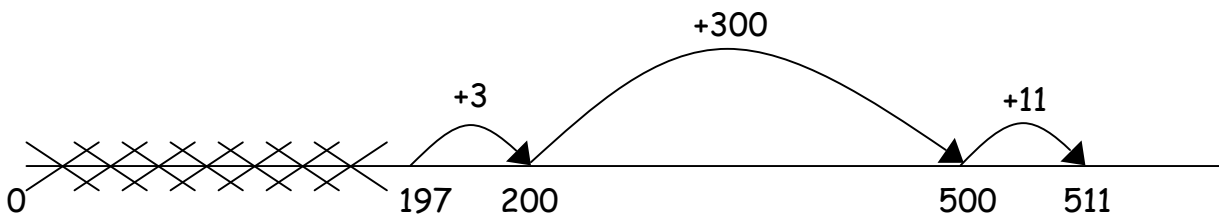
$$3.00 + 0.20 + 0.08 = 3.28$$

Children should:

- ✓ be able to subtract numbers with different numbers of digits;
- ✓ using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;
- ✓ know that decimal points should line up under each other.

When the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

$$511 - 197 = 314$$



Children should:

- ✓ be able to subtract numbers with different numbers of digits;
- ✓ begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;
- ✓ know that decimal points should line up under each other.

Year 5

Methods used in Year 4 are still used at the beginning of year for. Number sizes should now increase beyond 10,000. Extended methods may still be used for children who still struggle with the concept of place value.

- Children who are confident can move onto shortened, formalised method with decomposition once they are secure with extended methods

$$\begin{array}{r}
 6 1 \\
 3 \ 8 \ 7 \ 7 \ 4 \\
 - 2 \ 3 \ 1 \ 5 \ 9 \\
 \hline
 1 \ 5 \ 6 \ 1 \ 5
 \end{array}$$

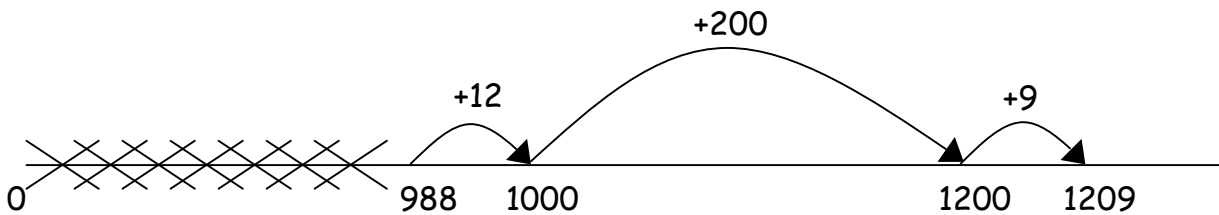
Children should work with numbers with mixed amounts of whole numbers and decimals.

- Children can move onto shortened, formalised method with decomposition once they are secure with extended methods

$$\begin{array}{r}
 1\ 13\ 11\ 9\ 1\ 1 \\
 2\ 4\ .\ 2\ 0\ 0 \\
 -\ 6\ .\ 7\ 3\ 1 \\
 \hline
 1\ 7\ .\ 4\ 6\ 9
 \end{array}$$

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

$$1209 - 988 = 221$$



Year 6

Shortened methods shown in Year 5 are used for increasingly larger numbers, i.e. numbers to 1,000,000.

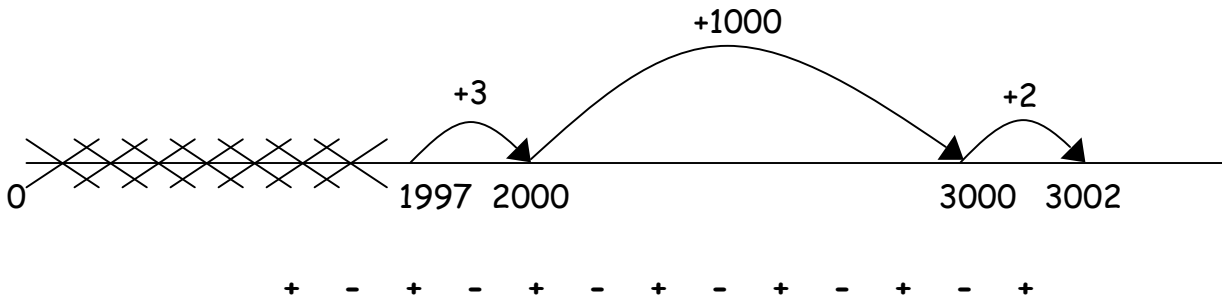
Children secure with methods can select methods which suit them. Formal methods are selected for difficult numbers whereas number lines are used with near multiples. Children will have developed mental skills with increasingly larger numbers.

Children should:

- ✓ be able to subtract numbers with different numbers of digits;
- ✓ be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;
- ✓ know that decimal points should line up under each other.
- ✓ Work out missing digits for partially completed methods.

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

$$3002 - 1997 = 1005$$



By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

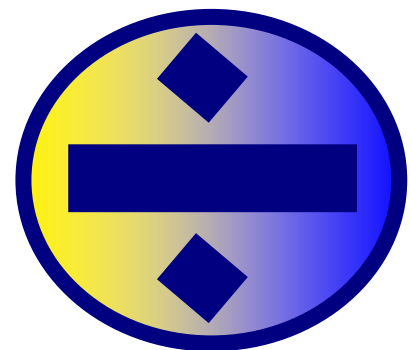
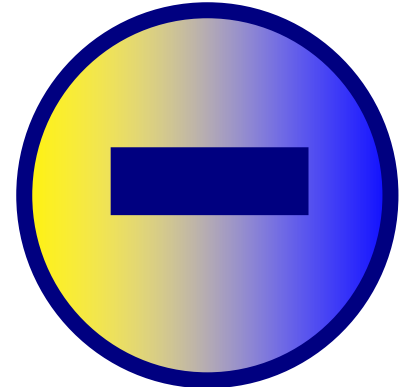
Children should not be made to go onto the next stage if:

- 3) they are not ready.
- 4) they are not confident.

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Multiplication Pathway



This document is designed to show the whole school progression of Calculation Strategies. Please refer to the School Curriculum Maps and Learning Ladders to see how calculation skills can be effectively taught across the maths curriculum.

MULTIPLICATION

Year 1

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Children will develop their understanding of multiplication and use jottings to support calculation. This will be heavily supported by adults in year 1.

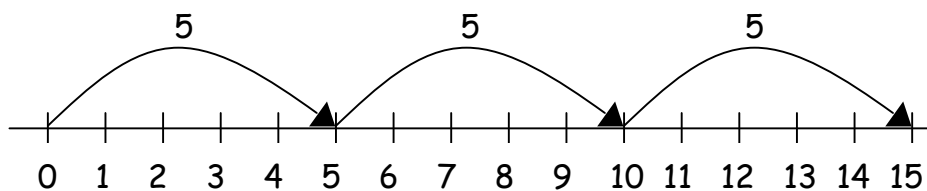
Year 2

✓ Repeated addition

3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

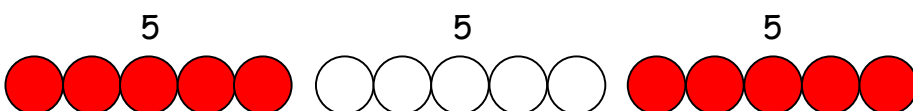
Repeated addition can be shown easily on a number line:

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



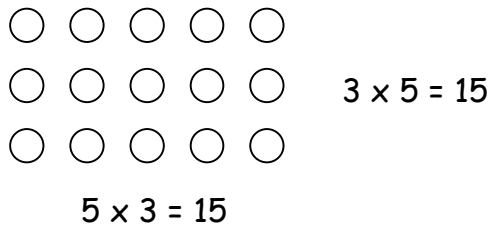
and on a bead bar:

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



✓ **Arrays**

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

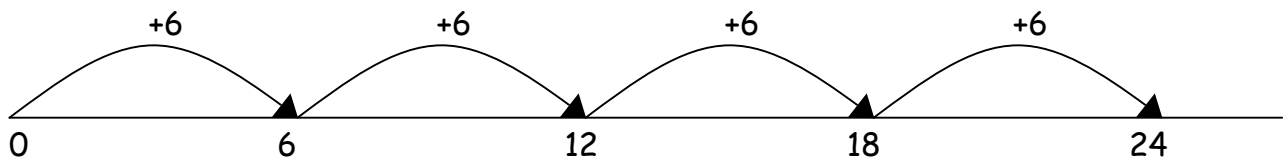


Children will continue to use:

✓ **Repeated addition**

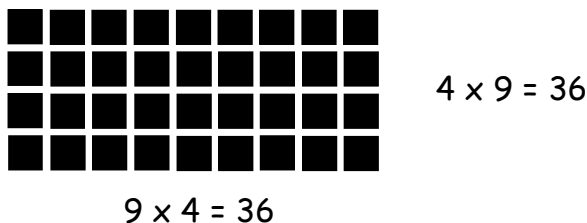
4 times 6 is $6 + 6 + 6 + 6 = 24$ or 4 lots of 6 or 6×4

Children should use number lines or bead bars to support their understanding.



✓ **Arrays**

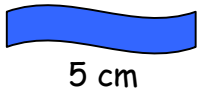
Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



Children will also develop an understanding of

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon.



5 cm



20 cm

- ✓ Using symbols to stand for unknown numbers to complete equations using inverse operations.

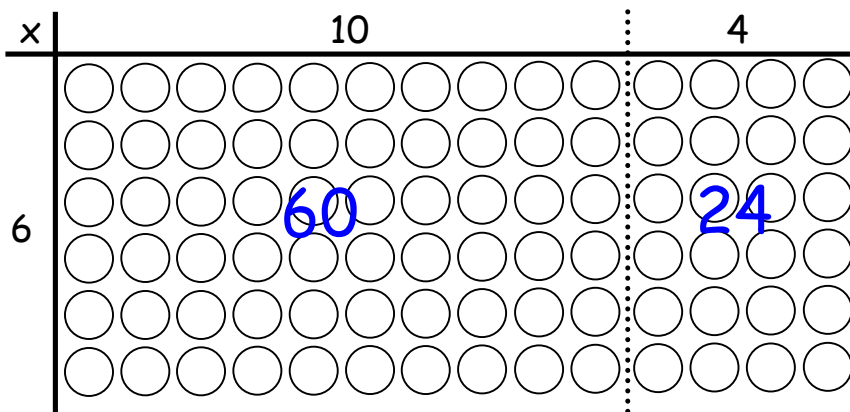
$\square \times 5 = 20$

$3 \times \triangle = 18$

$\square \times \circ = 32$

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

This can be used a model for teachers.



$(6 \times 10) + (6 \times 4)$

$60 + 24$

84

Children should learn that multiplication can be done in any order.

Year 3

Children should learn to use related facts to multiply multiples of 10 e.g.

$6 \times 3 = 18$

$3 \times 6 = 18$

$60 \times 3 = 180$

$30 \times 6 = 180$

The children can then learn how to multiply multiples of 100.

$6 \times 3 = 18$

$6 \times 30 = 180$

$6 \times 100 = 1800$

Once this knowledge has been secured, the children will be able to use the grid method to multiply TU x U's. Multiplication facts should be used to consolidate multiplication facts

the children are learning. For example; if the focus multiples are 3x and 6x during Spring Term, U's in the children's questions should be 3x and 6x.

TU X U

(Short multiplication - multiplication by a single digit)

$$23 \times 8$$

Children will approximate first.

$$23 \times 8 \text{ is approximately } 25 \times 8 = 200$$

$$\begin{array}{r} \times \quad 20 \quad 3 \\ 8 \quad \boxed{160} \quad \boxed{24} \end{array}$$

➤ To add up these numbers, children can use the addition pathway.

$$\begin{array}{r} 160 \\ + \quad 24 \\ \hline 100 (100+0) \\ 80 (60+20) \\ \quad 4 (4+0) \\ \hline 184 \end{array}$$

Year 4

Children will continue to multiply TU's and U's to secure their understanding. Children will continue to use the grid method for HTU x U's

Grid method

HTU x U

(Short multiplication - multiplication by a single digit)

$$346 \times 9$$

Children will approximate first.

$$346 \times 9 \text{ is approximately } 350 \times 10 = 3500$$

$$\begin{array}{r} \times \quad 300 \quad 40 \quad 6 \\ 9 \quad \boxed{2700} \quad \boxed{360} \quad \boxed{54} \end{array}$$

➤ To add up these numbers, the children should use the addition pathway as demonstrated in the addition pathway.

Year 5

Children will still be working initially with the grid method. Increasingly larger numbers should be introduced; ThHTU X U's moving onto TU X TU's.

Grid method

TU x TU

(Long multiplication - multiplication by more than a single digit)

$$72 \times 38$$

Children will approximate first.

$$72 \times 38 \text{ is approximately } 70 \times 40 = 2800$$

| | | |
|----|------|----|
| x | 70 | 2 |
| 30 | 2100 | 60 |
| 8 | 560 | 16 |

Like before, the children may use written methods shown in the addition pathway to add the numbers back up.

Using similar methods, they will be able to multiply decimals with up to 2 decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.

E.g. 4.9×3

Children will approximate first.

$$4.9 \times 3 \text{ is approximately } 5 \times 3 = 15$$

With decimals, work on related facts can also be taught in the build-up using their understanding of 10x bigger/smaller i.e. $2 \times 7 = 14$ so $0.2 \times 7 = 1.4$ or $2 \times 0.7 = 1.4$ etc.

| | | |
|---|----|-----|
| x | 4 | 0.9 |
| 3 | 12 | 2.7 |

| |
|----------------------|
| 12.0 |
| <u>+2.7</u> |
| 10.0 (10.0+0.0) |
| 4.0 (2.0+2.0) |
| <u>0.7 (0.0+0.7)</u> |
| 14.7 |

Children can also be shown the short written method once they understand the mechanics involved in the grid method.

ThHTU x U

(Short multiplication - multiplication by a single digit)

4346 x 8

Children will approximate first.

4346 x 8 is approximately 4346 x 10 = 43460

| | | | | |
|---|-------|------|-----|----|
| x | 4000 | 300 | 40 | 6 |
| 8 | 32000 | 2400 | 320 | 48 |

32000

2400

320

48

30000 (30000+0)

4000 (2000+2000)

700 (400+300)

60 (20+40)

8 (8+0)

34768

- Children may use the written methods shown in additions pathway.
- As shown in the addition pathway, year 5 children may choose how much recording they do when adding the digits back up. Here the brackets are shown but the children may leave out the brackets part altogether.

Once secure with the grid method, the children may move onto the shortened formal method.

4346

X 8

48

320

2400

32000

34768

- As you can see, the workings are the same as the numbers calculated in the grid method. This can be demonstrated by completing the two together.
- Where carries occur, refer to the addition pathway.

Year 6

HTU x TU

(Long multiplication - multiplication by more than a single digit)

$$372 \times 24$$

Children will approximate first

$$372 \times 24 \text{ is approximately } 400 \times 25 = 10000$$

| | | | |
|----|------|------|----|
| x | 300 | 70 | 2 |
| 20 | 6000 | 1400 | 40 |
| 4 | 1200 | 280 | 8 |

➤ NB; shortened methods are used although the grid method may still be used to demonstrate how the method works.

$$\begin{array}{r} 372 \\ \times 24 \\ \hline 8 \\ 280 \\ 1200 \\ 40 \\ 1400 \\ 6000 \\ \hline 8928 \\ 1 \end{array}$$

➤ Again carrying method can be used here for the addition section.

Once children have a good understanding of this, they move onto the final shortened method.

$$\begin{array}{r} 372 \\ \times 24 \\ \hline 1488 \\ \overset{1}{7}440 \\ \hline 8928 \\ 1 \end{array}$$

Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.

For example:

$$4.92 \times 3$$

Children will approximate first
 4.92×3 is approximately $5 \times 3 = 15$

| | | | |
|---|----|-----|------|
| x | 4 | 0.9 | 0.02 |
| 3 | 12 | 2.7 | 0.06 |

➤ NB; shortened methods are used although the grid method may still be used to demonstrate how the method works.

$$\begin{array}{r} 4.92 \\ \times \quad 3 \\ \hline 0.06 \\ 2.70 \\ \hline 12.00 \\ \hline 14.76 \end{array}$$

- Once children have mastered the grid method, they may move onto the shortened formal method.
- Again carrying method can be used here for the addition section.

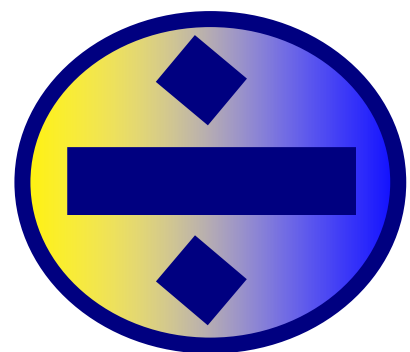
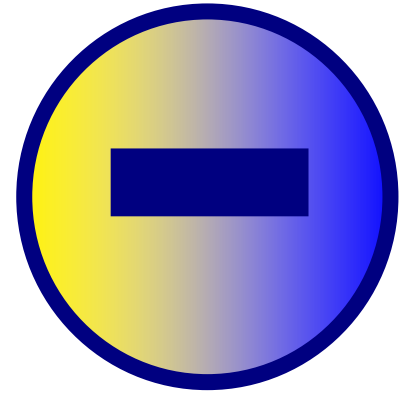
By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy such as inverse operations using corresponding pathways. Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Division Pathway



This document is designed to show the whole school progression of Calculation Strategies. Please refer to the School Curriculum Maps and Learning Ladders to see how calculation skills can be effectively taught across the maths curriculum.

Division

Year 1

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

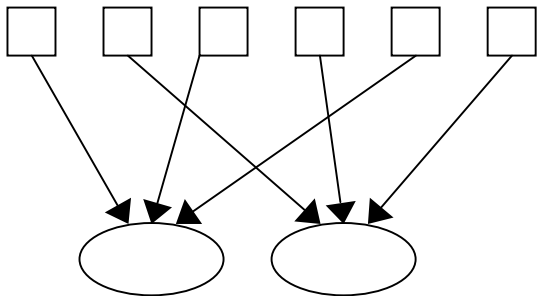


Year 2

Children will develop their understanding of division and use jottings to support calculation.

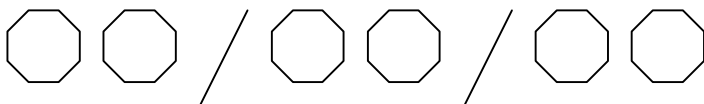
✓ **Sharing equally**

6 sweets shared between 2 people, how many do they each get? Spider method maybe introduced here if you think the children are able.



✓ **Grouping or repeated addition**

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



i.e counting on in 2's until they reach 6.

2, 4, 6 = they can count in 2's three times so three sweets each.

- ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

$$26 \div 2 = \square \quad 24 \div \triangle = 12 \quad \square \div 10 = 8$$

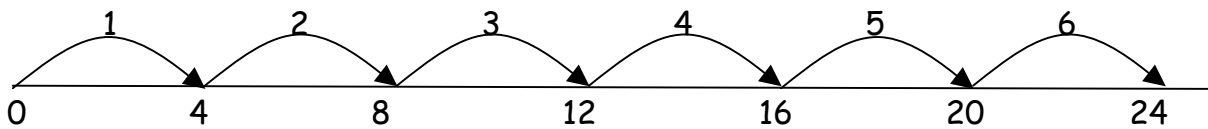
Ensure that the emphasis is on grouping rather than sharing.

Children will continue to use:

- ✓ **Repeated addition using a number line**

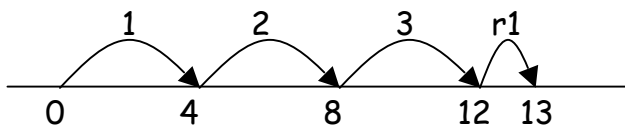
Children will use an empty number line to support their calculation and develop mental strategies for table facts.

$$24 \div 4 = 6$$



Children should also move onto calculations involving remainders.

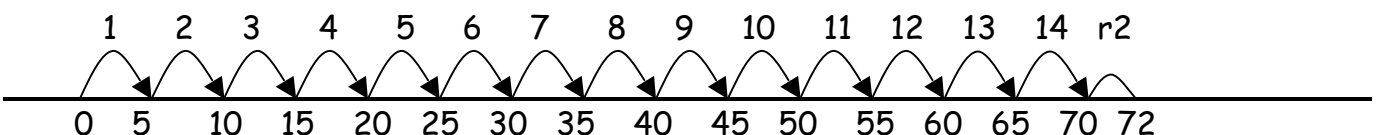
$$13 \div 4 = 3 \text{ r } 1$$



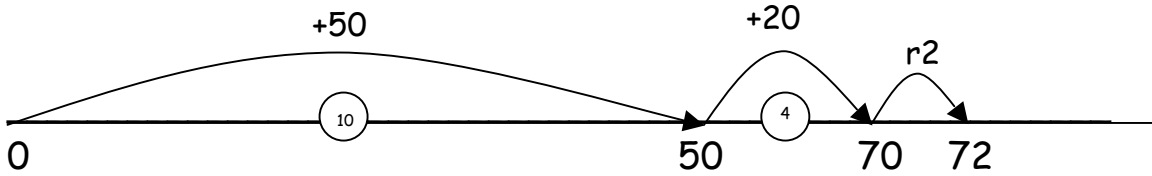
Year 3

Children will develop their use of repeated addition to be able to add multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s - numbers with which the children are more familiar. Then move on to of facts to x10.

$$72 \div 5 = 14 \text{ r } 2$$



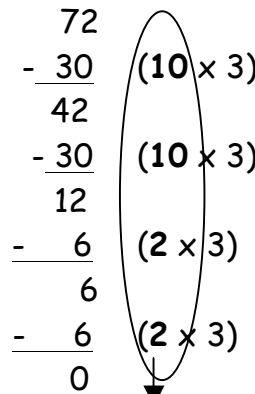
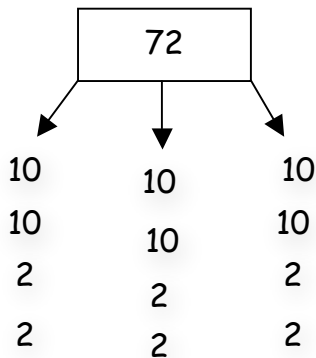
Moving onto:



Then onto the vertical chunking method with a practical element as shown in year 3 short division.

Short division TU ÷ U

$$72 \div 3 = 24$$

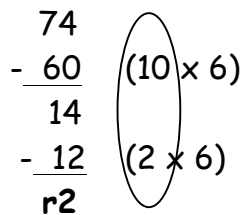
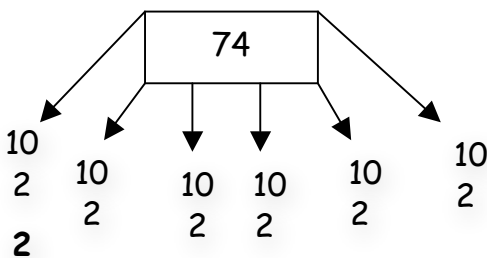


Answer : **24**

- Children may record in small groups at first i.e 1's, 2's, 5's etc.
- Encourage children to use rapid recall of number facts to support with calculations.

Short division TU ÷ U

$$74 \div 6 = 12r2$$



- Encourage children to keep a running count as shown in the short method.
- Work with divisors the children have covered in mental and oral starters until method procedures are secure.

Any remainders should be shown as integers, i.e. 12 remainder 2 or 12 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example $62 \div 8$ is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?

Answer: 7 (the remaining 6p is not enough to buy another sweet).

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?

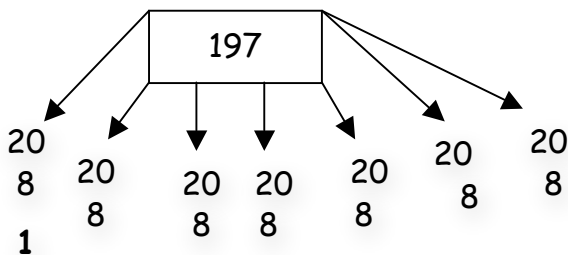
Answer: 8 (the remaining 6 apples still need to be placed into a box).

Year 4

Children should continue to work with $TU \div U$ and move on to subtract larger multiples of the divisor, e.g. $HTU \div U$.

Short division $HTU \div U$

$$197 \div 7 = 28r1$$



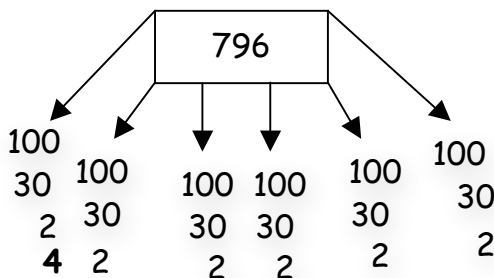
$$\begin{array}{r} 197 \\ - 140 \\ \hline 57 \\ - 56 \\ \hline r1 \end{array}$$

(20 x 7)
(8 x 7)

- Children should be encouraged to use known number facts (12x to 12x) when dealing with larger numbers.
- However, children may still be using x10 and 5 at this stage which is fine.

Then children should extend to working with numbers up to 1000. Here the children should be encouraged to count on in 50's, 100's etc involving numbers with and without remainders.

$$796 \div 6 = 132r4$$



$$\begin{array}{r} 796 \\ - 600 \\ \hline 196 \\ - 180 \\ \hline 16 \\ - 12 \\ \hline r4 \end{array}$$

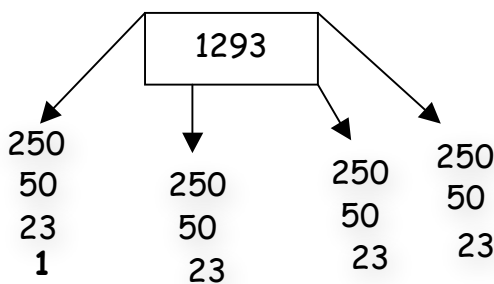
(100 x 6)
(30 x 6)
(2 x 6)

As in Year 3, children should make sensible decisions about rounding up or down after division. For example $235 \div 4$ is 58 remainder 3, but whether the answer should be rounded up to 59 or rounded down to 58 depends on the context.

Year 5

Children will continue to use methods used in Year 4. Children may now start using the expanded method without using a spider. Remainders should be converted to fractions or decimals where common fractions remain.

$$1293 \div 4 = 323r1 = 323 \frac{1}{4} = 323.25$$



$$\begin{array}{r} 1293 \\ - 1000 \quad (250 \times 4) \\ \hline 293 \\ - 200 \quad (50 \times 4) \\ \hline 93 \\ \underline{92} \quad (23 \times 4) \\ r1 \end{array}$$

➤ Here the spider method is shown but the children may now just use the shortened version.

Once children are confident with extended version, shortened methods may be introduced. Children should identify equivalent fractions where possible to convert to decimals.

$$6 \overline{) 0242} r4 \quad \text{or} \quad 242 \frac{4}{6} \quad \text{or} \quad 242.666 \text{ (Y6)}$$

$$6 \overline{) 1142516}$$

$$242 \frac{2}{3}$$

$$8 \overline{) 0319} r6 \quad \text{or} \quad 319 \frac{6}{8} \quad \text{or} \quad 319.75 \text{ (Y6)}$$

$$8 \overline{) 2251578}$$

$$319 \frac{3}{4}$$

Year 6

Children should now be working on shortened formal methods. Children should work with numbers where remainders need to be rounded to give an answer or converted into a fraction or decimal as in Year 5.

Children will continue to consolidate understanding of the shortened formal method with numbers to 4 digits and beyond.

When dividing HTU by TU or bigger, a long chunking method should be used. They should recognise the jottings as the same they have used in the spider method. It simply becomes impractical to add 20+ legs or work out carries in the shortened method.

$$972 \div 36 = 27$$

$$\begin{array}{r} 972 \\ - \underline{720} \quad (20 \times 36) \\ 252 \\ - \underline{180} \quad (5 \times 36) \\ 72 \\ - \underline{72} \quad (2 \times 36) \\ 0 \end{array}$$

By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy such as inverse operations using corresponding pathways. Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.