Thorpe Helsey Calculation Policy

Updated February 2022

About

The following calculation policy was devised in line with the Winterhill and Wingfield Learning Community 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. This has then been updated and regularly reviewed to meet the needs of our school. Please note that early learning in number and numerical patterns in EYFS follows the 'Development Matters' Early Years Foundation Stage (EYFS) document and the 'Revised Early years Curriculum 2021'. This calculation policy is designed to build on progressively from the content and methods established in the EYFS.

<u>Age stage expectations:</u>

The calculation policy is organised according to end of key stage expectations as set out in the National Curriculum 2014. It is expected that where children are working below the age expectations, they are shown and develop the strategies for earlier year groups. However, once a child is competent at the methods for their year group, they should be set challenges of a greater depth to consolidate their deep understanding. At Thorpe Hesley Primary School, alongside the other schools within the academy, we promote the use and development of mental, pictorial and formal strategies and present these in a variety of different contexts.

<u>Choosing a calculation method:</u>

Children need to build competency in their mathematics by using concrete objects, seeing pictorial representations and being encouraged to draw such representations themselves before moving to the abstract. Pictorial representations such as 'bar models' are often essential when children attempt to solve problems. Therefore they need to be encouraged to use the following processes in deciding what approach they will take to a calculation. This is to ensure they select the most appropriate method for the numbers involved. There are examples within the policy where the written calculations are pictorial representations of mental calculations and in some instances a written method will not be required. Equally, there is flexibility for earlier methods to be selected when answering a question and this should not be seen as a step back in learning.

<u>Providing a context for calculation:</u>

It is important that any type of calculation is given a real-life application 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. All children must have a regular opportunity to apply their mathematics. They must be encouraged to draw images such as 'bar models', label what they know, underline key information, and do jottings to support their problem solving.

<u>Mathematics planning and assessment:</u>

We follow the White Rose Maths schemes of work as a basis for effective planning; this provides some clear examples of expected progression for 'Fluency, Reasoning and Problem Solving'. Children are set for maths within their current year groups however staff always plan together to ensure consistency and progression. To improve fluency and recall of times tables, TT Rockstars is used on a regular basis from year 2 to year 6. White Rose formal assessments are completed on a termly basis alongside a mental maths tests. Pre and post learning takes place regularly to address misconceptions and support individuals and small groups with new learning. All data is analysed and used to inform future planning and intervention.

Addition

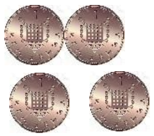
Initial experiences should involve physical counting with a range of objects.
E.g.

- Fingers
- Numicon
- Claps or drum beats/actions
- Moveable objects

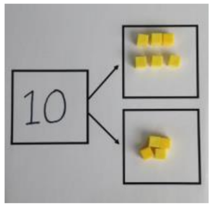
Number songs and rhymes should be an integral part of teaching number.

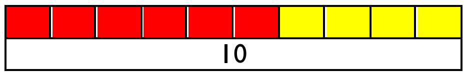
When children are confident at counting both groups altogether they can begin counting on from a number to find the total.
This can be supported by putting objects in a container
E.g. pennies in a purse
sweets in a bag

4p and 2p



Part - whole model: this model can be used to combine two parts to make a whole. Use cubes and numicon to add two numbers together as a group or in a bar.





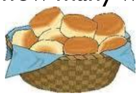
Subtraction

Initial experiences should involve physical and oral counting backwards with a range of songs and rhymes, objects and real life situations.
E.g. fingers, Numicon, pegs, coins, moveable objects and songs

Subtraction as taking away or difference

Knowledge of 1 more and 1 less.

- Use tins and counters.
  E.g. If we had 8 biscuits and we ate one, how many would be left?

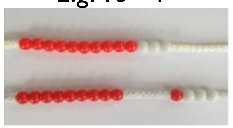


- Use Numicon. E.g. You have a seven and take 1 away/ cover 1 up /hide 1. What do you have left?

Use a 10 frame as an alternative visual model Eg, 10-2 = 8

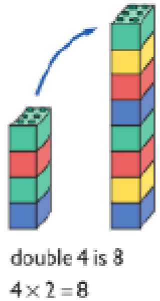
	•	•	•	•
	•	•	•	•

- Use washing line and spotty cards.
  E.g. Find a card with one spot and peg it on the line. Find a card with one more spot etc.
- Use human number lines
  E.g. give children a number from 1-10 and ask them to make a human number line.
- Use counters and move them away from the group, counting back as you do so.
  E.g. 13 - 4



Multiplication

Doubling
Use practical activities show how to double numbers.
E.g.



Counting in pairs / groups

Begin to lay the foundations for multiplying by maximising opportunities when counting.

E.g. Number rhymes such as two, four, six, eight, ten fat sausages sizzling in a pan.

E.g. Pairs of children, socks, animal legs, eggs in an egg box, 2p coins, etc.

Division

Sharing

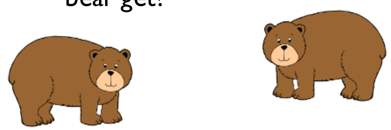
Requires secure counting skills
Develops importance of one-to-one correspondence

Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops, etc.

Grouping
Sorting objects into 2's
E.g.

- How many pairs of socks are there?

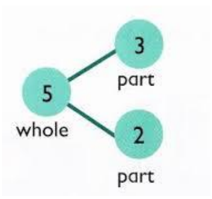
- How many biscuits does each bear get?

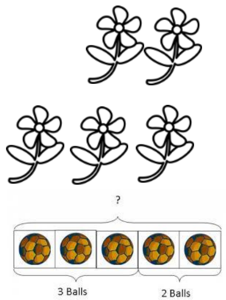


For the exceeding strand, introduce finding half as sharing between 2. Use a rectangle to share objects into, to support bar modelling.

Make links to money and find different ways to make various amounts of money.

As children become more confident, they will begin to commit these number bonds to memory and should be encouraged to use these facts in their play and learning.

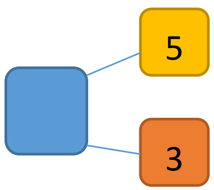




E.g.
Di has 6p. Her Mum gives her 4p. How much does she have altogether?
Or Di has 10p she spends 6p, how much does she have left?
Or Di has 6p how much more does she need to make 10p altogether?

These number bonds can be shown as simple number sentences e.g. 10p = 6p + 4p
20p = 15p + 5p

Use the part-part whole diagram as shown above to move into the abstract.



Use Numicon to investigate which 2 plates fit into a larger number. Extend to 3, 4 or more

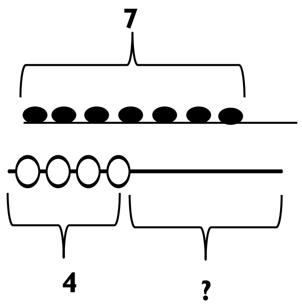
Move to counting back on a number line, starting with the larger and showing the jumps to reach the smaller, then ending by mentally holding numbers in your head and counting back using fingers to help.

Understanding of the difference between two numbers:

- Use washing line or number track to count on, e.g. from 6 to 8
- To find the difference between 4 and 7, make lines of each number and count on from the smaller number.
- Use a bar model to show the difference between two numbers
  Eg. the difference between 5 and 3

•	•	•	•	•
		•	•	•

- What's the difference between 7 and 4?



plates as an additional challenge. Record as above. Children can add two single digits where the answer is a maximum of 20.			

Addition

Children should continue to use physical objects for counting and combining initially. Numicon should be used as a visual model.

Eg. 

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1 + 1
2 + 3 = 4 + 1
3 = 3
2 + 2 + 2 = 4 + 2

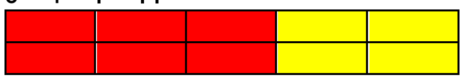
Missing numbers need to be placed in all possible places.

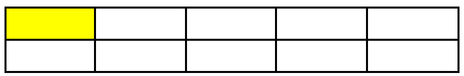
3 + 4 = ∇	∇ = 3 + 4
3 + ∇ = 7	7 = ∇ + 4
∇ + 4 = 7	7 = 3 + ∇
○ + ∇ = 7	7 = ∇ + ○

Children should have access to a wide range of counting equipment and everyday objects, such as hoops, sorting trays, number tracks and number lines, to support their problem solving

Re-grouping

Recognise numbers bonds and related facts within 20.
Re-group numbers to make 10.
6 + 5 = 11
6 + 4 + 1 = 11



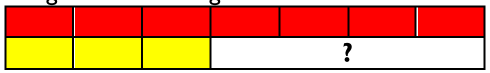


Subtraction

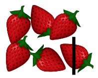
Number sentences and missing number

7 - 3 = ∇	∇ = 7 - 3
7 - ∇ = 4	4 = ∇ - 3
∇ - 3 = 4	4 = 7 - ∇
○ - ∇ = 4	4 = 7 - ∇

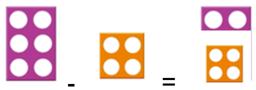
These calculations can also be represented using bar models. E.g.



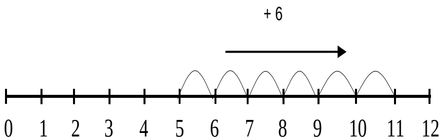
Understand subtraction as 'take away'.
E.g. 6 – 1 = 5



Use Numicon to cover the larger number with the smaller number to reveal how many are left. Eg. 6-4=2



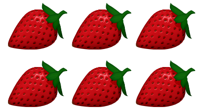
But also as a 'difference' by counting up.
E.g. I have saved £5. The socks that I want to buy cost £11. How much more do I need in order to buy the socks?



Use practical and informal written methods to support the subtraction of a one-digit number from a one or two-digit number and a multiple of 10 from a two-digit number.

Multiplication

Multiplication is related to doubling and counting groups of the same size (repeated addition).



Use of arrays

Looking at columns	Looking at rows
2 + 2 + 2	3 + 3
3 groups of 2	2 groups of 3

<u>Counting using a variety of practical resources</u>

Counting in 2s
e.g. counting socks, shoes, animal legs…
Counting in 5s
e.g. counting fingers, fingers in gloves, toes…
Counting in 10s
e.g. fingers, toes…

Make bundles of 5 or 10 straws and practice grouping objects.

Pictures / marks

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

Division

<u>Sharing</u>

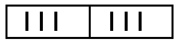
Once children are confident at sharing and grouping objects practically they can be encouraged to make simple jottings.

Initially this could be using physical objects but requiring children to draw the correct number of places, circles, plates etc.

Next children should be encouraged to make simple drawings to help solve their problems.
Checking by counting that all groups are the same.

Sharing

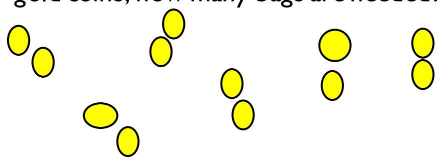
6 sweets are shared between 2 people. How many do they have each? Use practical objects to share between 2 cells.



6 ÷ 2 = 3

Grouping

Each bag holds 2 gold coins. If there are 12 gold coins, how many bags are needed?

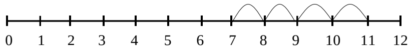


The number sentence can be modelled alongside if required.
E.g. 12 ÷ 2 = 6
12 ÷ 6 = 2

Drawing jumps on numbered number lines to support understanding of the mental method

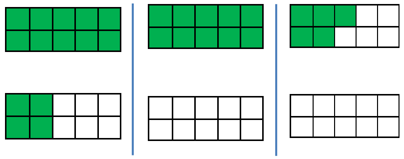
Children can create their own jumps using rulers, fingers, pens, bodies etc.

7 + 4



"Make 10" Method

E.g. 14 – 9 = 14 – 4 – 5



Use the vocabulary related to addition and subtraction and symbols to describe and record addition and subtraction number sentences.

Recording by

- drawing jumps on prepared lines
- constructing own lines

Use a bar model to represent multiplication in a different way – use numbers and apparatus.

5	5	5
?		

or

?		
5	5	5

5 x 3= 15

Use a bar model to illustrate this.

12	
IIIIII	IIIIII

or

12					
II	II	II	II	II	II

Addition

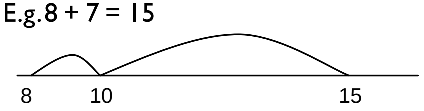
Number sentences

Continue using a range of equations but with appropriate, larger numbers. E.g. 13 + 4 = ∇

Children also need to be confident in bridging through 10.

Children should be able to partition the 7 to relate adding the 2 and then the 5.

E.g. 8 + 7 = 15

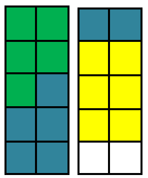


Number lines are a good visual model of this, but the ultimate aim is to develop a recall of these number bonds so that addition can be done by partitioning.

Add three separate single digit numbers

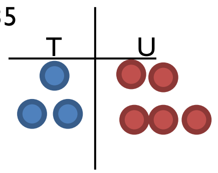
Children should be confident adding 3 single digits. They are still to "make 10" with 2 of the digits if possible.

E.g. 5 + 7 + 6



Partition into tens and ones and recombine

E.g. 12 + 23 = 35



12 + 23 = 10 + 2 + 20 + 3
= 30 + 5
= 35

Subtraction

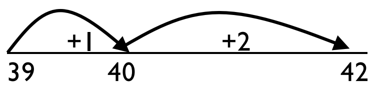
Number sentences and missing numbers

Continue using a range of equations as at year 1 but with appropriate numbers.

Extend to 14 + 5 = 20 - ∇

Find a small difference by counting up

42 – 39 = 3

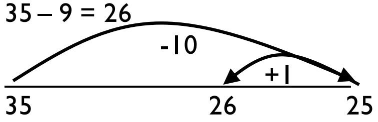


Begin to see subtraction as a difference pictorially through the use of bar model images

42	
39	?

Subtract 9 or 11. Begin to add/subtract 19 or 21

35 – 9 = 26



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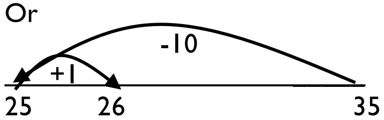
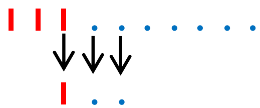


Use known number facts and place value to subtract (partition where appropriate)

E.g. 37 – 12



The answer is what **has not** been pulled down.

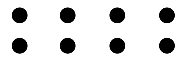
Multiplication

Number sentences

7 x 2 = ∇	∇ = 2 x 7
7 x ∇ = 14	14 = ∇ x 7
∇ x 2 = 14	14 = 2 x ∇
○ x ∇ = 14	14 = ∇ x ○

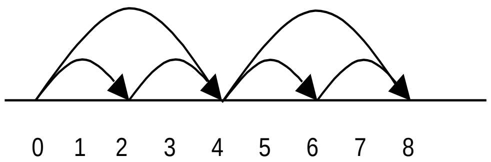
Arrays and repeated addition

Continue to use arrays and repeated addition where necessary.

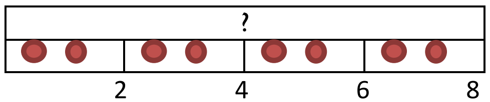


4 x 2 or 2 + 2 + 2 + 2

2 x 4 or 4 + 4



Use bar models with either apparatus or numbers.



?			
2	2	2	2
2	4	6	8

Doubling multiples of 5 up to 50

15 x 2 = 30

Partition

Children need to be secure with partitioning numbers into 10s and 1s and partitioning in different ways: 6 = 5 + 1 so

E.g. Double 6 is the same as double five add double one.

Division

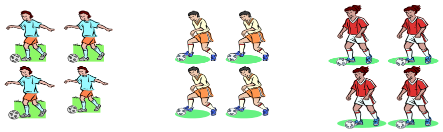
Once children understand the process, number sentences and the number facts that have learnt can be solved as missing number problems.

E.g.

6 ÷ 2 = ∇	∇ = 6 ÷ 2
6 ÷ ∇ = 3	3 = 6 ÷ ∇

E.g. Practical grouping

12 children get into teams of 4 to play a game. How many teams are there?



As children become more confident in the process of sharing, they should be encouraged to simplify their drawings to simple jottings, again, checking that all groups are the same.

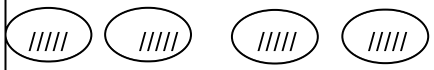
E.g. There are 6 strawberries.

How many people can have 2 each?

// // //

6		
II	II	II

There are 20 sweets and 4 friends share them between themselves. How many do they get each?



20			
IIIII	IIIII	IIIII	IIIII

Children should be encouraged to look for problems where they can find 'short cuts'
E.g. Counting on in tens and ones

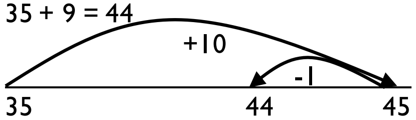
$23 + 12 = 23 + 10 + 2$
$= 33 + 2$
$= 35$

This can then be used with numbers which bridge the tens boundary

E.g. $27+36 = 20 + 7 + 30 + 6$
$= 50 + 7 + 6$
$= 50 + 13$
$= 50 + 10 + 3$
$= 60 + 3$

E.g. Add 9 by adding 10 and adjusting by 1

$35 + 9 = 44$

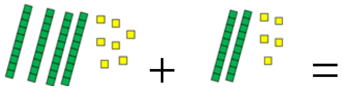


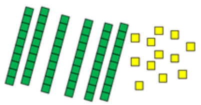
Towards a Written Method

Partitioning in different ways and recombine

47+25

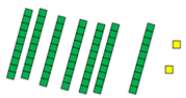
47 **25** **60**
+ 12





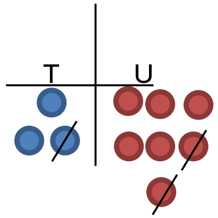
Leading to exchanging:

72

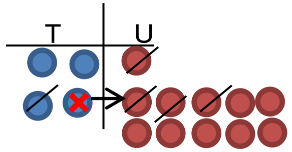


Expanded written method

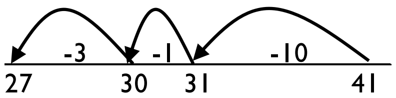
Or



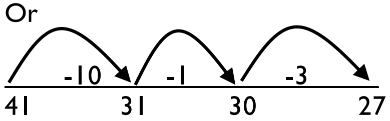
Move to partitioning (where appropriate)
E.g. $41 – 14 = 27$



E.g. $41 – 14 = 41 – 10 – 1 - 3$
$= 27$

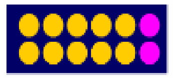


Or



Towards written methods

Recording addition and subtraction in expanded columns can support understanding of the quantity aspect of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes apparatus. E.g. 75 – 42

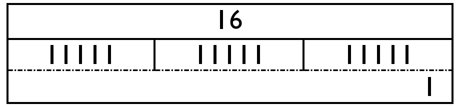


E.g. Double 15 can be viewed as

$10 + 5$
↓ ↓
$20 + 10 = 30$

Children also need to be taught that if they are not all equal the extra ones must be left as a remainder.
E.g. 16 stickers are shared between 3 children. How many do they get each?

5, with 1 left over.



40 + 7 + 20 + 5 =

$$\begin{array}{rl} & 40 + 7 \\ + & \underline{20 + 5} \\ & 60 + 12 = 72 \end{array}$$

40+20 + 7 + 5 =
60 + 12 = 72

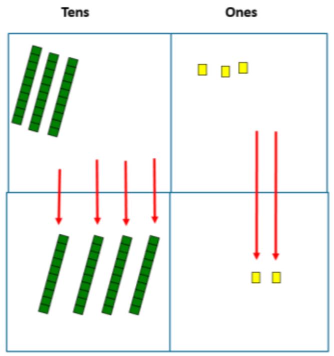
Formal Written method

$$\begin{array}{rcc} & T & O \\ & 4 & 7 \\ + & 2 & 5 \\ \hline & & \\ \hline \end{array}$$

Missing number equations

30 + 6 = 25 + $\square$

13 + 7 = $\square$ + 12



$$\begin{array}{rcc} & 70 & 5 \\ - & 40 & 2 \\ \hline & 30 & 3 \\ \hline \end{array}$$

Formal Written method

$$\begin{array}{rcc} & T & O \\ & 7 & 5 \\ - & 4 & 2 \\ \hline & 3 & 3 \\ \hline \end{array}$$

Missing number equations

36 - 6 = 40 - $\square$

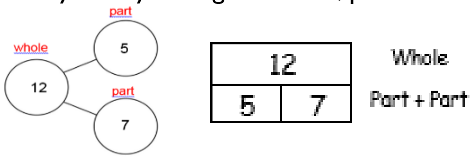
13 - $\square$ = 12 - 6

Addition

Continue to practise mental strategies e.g.

- recall number bonds
- use 'nearly numbers' for adding 9, 19, 29, etc. and 11, 21, 31, etc.

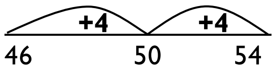
Continue practising partitioning numbers in a variety of ways using the whole, part model.



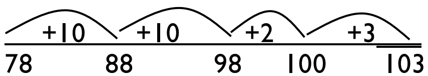
Continue to add by bridging through 10.

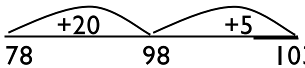
E.g. 46 + 8
= (46 + 4) + 4
= 50 + 4

Use number lines to support calculations.



E.g. 25 + 78





Continue to partition into tens and units.

E.g. 25 + 78 = 103
= (20 + 70 + 5 + 8)
= 90 + 13

Teach partitioning using known number facts.

E.g. 25 + 78 = 103
= (25 + 75) + 3
= 100 + 3

E.g. 38 + 35 = 73
= (Double 35) + 3

Subtraction

Continue to practise mental strategies e.g.

- recall number bonds
- use 'nearly numbers' for subtracting 9, 19, 11, 21, etc.
- count back in 10s, 100s

Gradually extend use of complimentary addition (**<u>counting on</u>**/find the difference) to most subtractions.

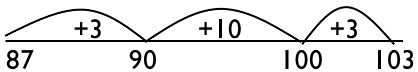
Use a 'bar' model as a pictorial representation of subtractions.

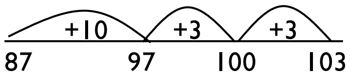
103	
87	?

103	
87	3 + 10 + 3

Use number lines to support calculations. Vary the jumps in line with the calculation to find most appropriate numbers.

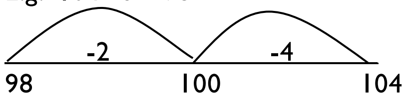
E.g. 103 – 87 = 16





<u>Counting back</u> when subtracting a small number from a comparatively large number. Bridge through 100s and 10s as appropriate.

E.g. 104 - 6 = 98



Multiplication

Continue to practice mental strategies e.g.

- recall times tables
- use 'doubling' strategy

Teach and use a range of images to support understanding.

Children should also be taught to add up 70 x 3 by knowing
7 x 3 = 21 so 70 x 3 = 210

Using Grid Method
E.g. 23 x 3 = 69

X	20	3
3	60	9

60 +
9
69

Move onto 543 x 8

X	500	40	3
8	4000	320	24

4000
320 +
24

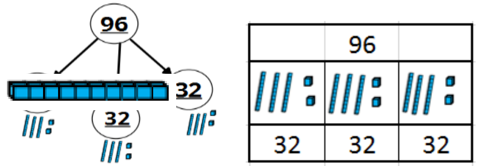
Division

Continue to practice mental strategies e.g.

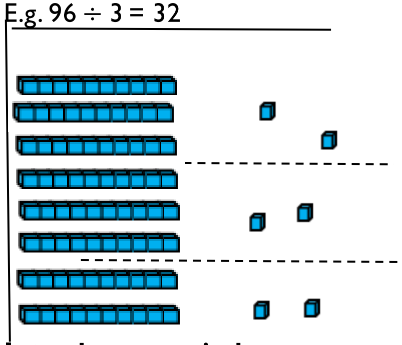
- division is the inverse of multiplication
- use 'halving' strategy

Reinforce the concept of division mainly through grouping but also making the link to fractions and therefore sharing.

Use Dienes in a variety of ways to model and support mental strategies.

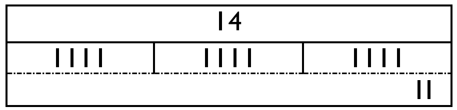


E.g. 96 ÷ 3 = 32



Introduce remainders

E.g. 14 ÷ 3 = 4 r2

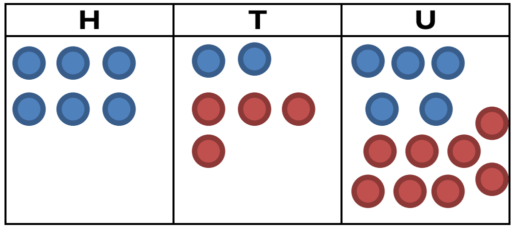


Begin to teach **short division** to HTU ÷ U and including remainders.

Use **doubles** and **number bonds** to teach new facts.
E.g. 2 + 3 = 5 So 20 + 30 = 50

Model with visual representations such as 'bar models' and either counters or Dienes (Base 10).

E.g. 625 + 48



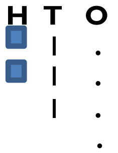
Use knowledge of partitioning to develop from:
625 + 48
600 + 60 + 13 = 673

<table>
<tr><td colspan="3">?</td></tr>
<tr><td colspan="2">625</td><td>48</td></tr>
<tr><td>600</td><td>20 + 40 (60)</td><td>5 + 8 (13)</td></tr>
</table>

<u>Formal Written method after revising practical as necessary</u>

	H	T	O
+	1	3	7
	1	4	6
	2	8	3
		1	

Model with Dienes
E.g.
234 – 121 = 113



Physically take away 121 from the 234.

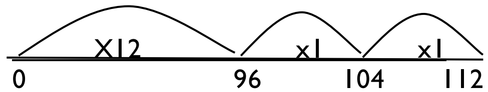
Continue to model by exchanging using Dienes. (see Year 2)

<u>Formal Written method after revising practical as necessary</u>

	H	T	O
-	3	$^{6}\cancel{7}$	$^{1}2$
	1	4	6
	2	2	6

Students to understand the concept of division as 'chunks' using a number line.

Eg 112 ÷ 8 = 14



Adding decimals Introduce decimal numbers though money. Extend to include decimals to 2 decimal places in the context of **money/measures**. £2.2 8+ £5.4 6 £7. 7 4 1			

Addition

Continue to practise **mental strategies** e.g.

- recall number bonds to 10 and 100
- 'nearly numbers' for adding 9, 19, 11, 21, etc.
- Extend 'nearly numbers' to include 18, 28, 38 and 12, 22, 32, etc.

Extend **'bridging through'** into bridging through 1000.

E.g. 986 + 18
= (986 + 14) + 4
= 1000 + 4

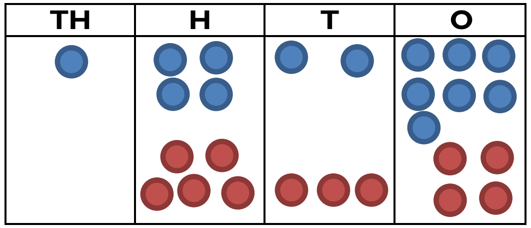
Partition larger numbers in a variety of ways to aid addition.

E.g. 458 + 72
Is the same as 460 + 70

Use 'bar models' to demonstrate visually.

?	
1427	534

Use Dienes or counters for visualisation.




```
   1 4 2 7
+    5 3 4
  ________

  ________
```

Students can apply these skills to a range of problems, including missing boxes.

Subtraction

Continue to practise **mental strategies** e.g.

- 'nearly numbers' for subtracting 9, 19, 11, 21, etc.
- Count back in 10's, 100's, 1000's.

Extend counting on method to larger numbers, supported by use of bar models.
705 – 684 =

705	
684	**?**

705		
684	**16**	**5**

Children need to be able to use their mental recall of number bonds to support **efficient subtraction** of larger numbers.
E.g. 1427 – 534

1427	
534	**?**

1427		
534	**66**	**827**

= 893

```
   1 4 2 7
-    5 3 4
  ________

  ________
```

Children should know when it is easier to **count back** e.g. 1008 – 12

Use Dienes or counters for visualisation to ensure children have a good understanding.

Multiplication

Continue to practise **mental strategies** e.g.

- recall all times tables facts to 12 x 12
- multiply by 10 and 100

Extend multiplication to HTU x U using a range of 'bar models'.

E.g. 246 x 8
Approximate by rounding first:
200 x 8 = 1600
← 246 x 8
300 x 8 = 2400

246 x 8 = 1968

Introduce expanded written method for multiplication of 3 digit x 1 digit numbers
Informal

```
  2 4 6
x     8
    4 8    (6 x8)
  3 2 0    (40 x8)
1 6 0 0    (200 x 8)
1 9 6 8
```

```
  2 4 6
x     8
    4 8
  3 2 0
1 6 0 0
1 9 6 8
```

Division

Consolidate mental strategies from year 3, and begin to teach **short division** to ThHTU ÷ U and including remainders.

Continue to practise **mental strategies** e.g.

- derive all division facts for times tables
- continue to divide by 10 and 100

Students must be given opportunities to do divisions with and without remainders.

Encourage pupils to develop more informal methods for certain questions when possible.
E.g.
56 ÷ 4 = 14

Because

$$\left\{\begin{array}{l} 56 \div 2 = 28 \\ 56 \quad 28 \div 2 \end{array}\right\} \begin{array}{l} 14 \\ = 14 \end{array}$$

Extend division to HTU ÷ U using dienes/counters, 'bar models' and number lines to support calculation understanding and recording.

252 ÷ 7 = **?**						
36	36	36	36	36	36	36

Taught alongside

```
    3 6
7 ) 2 ²5 ⁴2
```

E.g.

1000		
?	**353**	**354**

493	**?**
2000	

Add in numbers with different numbers of digits e.g.

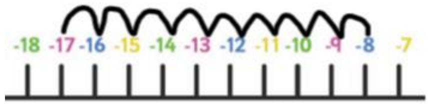
```
    3 4 5
+ 2 1 3 6
_________
```

Add decimals

```
   6 . 4 3
+  1 . 2 6
   _ . _ _
```

Subtracting negative numbers

-8 – 9 = -17



The same methods should be modelled involving remainders.

E.g. 255 ÷ 7 = 36 r3

255 ÷ 7 = **?**		
30 x 7 = 210	**6** x 7 = 42	R3

$$7\overline{\smash{)}\cancel{2}\,{}^{2}5\,{}^{4}5}\quad 36\text{ r }3$$

Addition	Subtraction	Multiplication	Division
Continue to practise and use mental addition strategies from years 3 and 4. **Use mental methods where possible to add.** **Introduce column addition up to HThThHTU.** Add several numbers with different numbers of digits. E.g. Find the total of 42, 6432, 786, 3, 4681 6432 4681 786 42 3 + 11944 121 Students can apply these skills to a range of problems, including missing boxes. E.g. 1 5 □ 4 □ 4 + □ 1 5 Continue to develop mental skills through the use of adjustments. E.g. 15003 + 4697 = 15000 + 4700 E.g. 2936 + 1999 = 2935 + 2000 Continue to develop addition of decimals to include numbers with different numbers of decimal places. E.g. 2 . 5 + 1 3 . 6 7 ______	Continue to practise and use mental subtraction strategies from years 3 and 4. **Introduce the standard written method, up to an including ThHTU, with exchanging.** E.g. 1487 – 234 1487 - 234 1253 E.g. 3228 - 1615 2 1 ~~3~~ 2 2 8 - 1 6 1 5 1 6 1 3 Students can apply these skills to a range of problems, including missing boxes. □ 2 4 4 □ □ - 4 1 2 Continue to develop mental skills through the use of adjustments. E.g. 10,000 – 3627 = 9999 - 3626 Extend to include decimals to 2 decimal places in the context of **money/measures**. Introduce 'counting on' method of subtraction for decimals in the context of money. Use a number line to model it. E.g. £4.30 – £2.80 = £1.50 +£0.20 +£1.30 £2.80 £3.00 £4.30	Consolidate formal and informal methods from previous years **Long Multiplication TU x TU** E.g. 72 x 38 **Approximate by rounding** first: 70 x 40 = 2800 7 2 x 3 8 $5\ 7^{1}6$ (8 x 72) 2 1 6 0 (30 x 72) 2 7 3 6 2 1 Leading to: 7 2 x 3 8 $5\ 7^{1}\ 6$ 2 1 6 0 2 7 3 6 This can be extended to **ThHTU x TU** once children are competent at this method.	Consolidate formal and informal methods from previous years They should also be given opportunities to give answers rounded up or down. E.g. A piece of rope is 1534m long. It is cut into sections 5m long. How many pieces of rope can be cut? 0 3 0 6 r 4 = 306 pieces. $5 \overline{)\,1\ {}^{1}5\ 3\ {}^{3}4}$ They should be taught to do division of decimal numbers. 9 1 . 6 $3 \overline{)\,\cancel{2}\ {}^{2}7\ 4\ .\ {}^{1}8}$

	Continue to develop the use of standard written method and extend to decimals, in the context of money and measures. E.g. £3^{5}~~6.~~^{1}5 7 - £1 3. 8 4 £2 2. 7 3		

Addition	Subtraction	Multiplication	Division
Consolidate and refine mental strategies for addition, developing fluency and speed. Apply and using these in the context of money and measures. Extend to numbers up to 10,000,000 and decimals with different numbers of digits with up to three decimal places. Make sure children are encouraged to make numbers have the same number of digits after a decimal point to support calculations. E.g. 15.98 + 26.314 = 15.98**0** 126.314 + 122.294 1 1 Continue to use missing box activities, where both addition and subtraction may be required to find the answer. Begin to add numbers including negatives, in context, without a number line. A number line with positive and negative numbers should continue to be used to clearly illustrate the learning image in various positions.	Consolidate and refine mental strategies for subtraction, developing fluency and speed. Apply and using these in the context of money and measures. Extend to numbers up to 10,000,000 and decimals with different numbers of digits with up to two decimal places. Make sure children are encouraged to make numbers have the same number of digits after a decimal point to support calculations. E.g. 325.9 - 34.31 = $^{2}\cancel{3}{}^{1}25.{}^{8}\cancel{9}{}^{1}\mathbf{0}$ 34. 3 1 - 2 9 1. 5 9 Continue to use missing box activities, where both addition and subtraction may be required to find the answer. E.g. 3.27 - $\boxed{}$ = 1.13 Begin to subtract numbers including negatives, always in context. A number line with positive and negative numbers should continue to be used to clearly illustrate the learning image. E.g. -£2 - £7 = - £9 2p – 7p = -5p -7m - - 2m = -5m	Consolidate formal and informal methods from previous years Consolidate formal written methods up to **ThHTU x TU** E.g. 124 X 36 $7{}^{1}4{}^{2}4$ + $3\,7{}^{1}2\,0$ $4{}^{1}4\,6\,4$ Extend formal written methods to multiplying decimal numbers, up to 2 decimal places, by 1 and 2 digit integers E.g. 2 . 3 X 3 6 . 9 Or alternatively use relationship to whole numbers E.g. 23 x 3 = 69 69 ÷ 10 = 6.9 **Moving on to multiply a decimal by a decimal** 2 . 3 X 3 . 7 8 .51 Or alternatively use relationship to whole numbers E.g. 23 x 37 = 851 851 ÷ 10 = 8.51	Consolidate short division methods from previous years. Teach division giving answers as a decimal. E.g. 73 ÷ 4 = 1 8 r 1 4 ⌈ $7\,{}^{3}3$ And 1 8. 2 5 4 ⌈ $7\,{}^{3}3.{}^{1}0{}^{2}0$ Long division methods should be taught for division by 2 digit numbers Extending up to **ThHTU ÷ TU** **e.g. 7762 ÷ 18** The 1, 2, 10 & 5 x tables should be noted to support the calculation – children can then work out all the additional ones if needed. 1 x 18 = 18 2 x 18 = 36 5 x 18 = 90 10 x 18 = 180 0431r4 18 ⌈ 7762

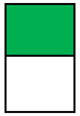
Fractions

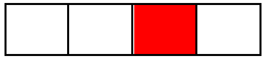
Links to real life problems should be made at all stages.

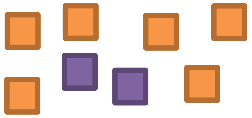
Suggested Expectations at Y1

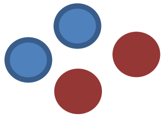
Halves and quarters

Identify one half ($^{1}/_{2}$) or one quarter ($^{1}/_{4}$) of a shape, quantity or number







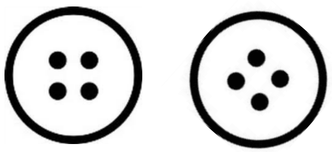


6	
3	3

Find one half or one quarter of a given quantity (with or without the use of apparatus)

E.g. One half (½) of 8 = 4.

One quarter (¼) of 12 = 3

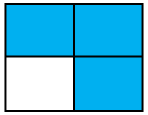


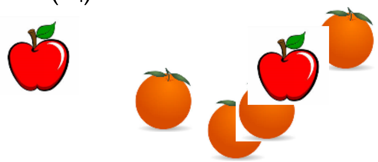
12			
3	3	3	3

Suggested Expectations at Y2

Halves, quarters and thirds

Continue to practise finding one half or one quarter of a shape or quantity, then extend to finding one third ($^{1}/_{3}$) or three quarters ($^{3}/_{4}$) .





Practise finding one half and one quarter of a quantity and extend to finding one third ($^{1}/_{3}$) or three quarters ($^{3}/_{4}$) .

Students should use the multiplication rules to help when sharing quantities.

E.g. One third ($^{1}/_{3}$) of 12 = 4.

12		
4	4	4

Three quarters ($^{3}/_{4}$) of 20 = 15.

20			
5	5	5	5

Comparing simple fractions

Identify whether it is better to have one half or one quarter of a given quantity.

E.g. Which is larger: $^{1}/_{4}$ of £20 or $^{1}/_{2}$ of £8?

$^{1}/_{4}$ of £20 = £5

20			
5	5	5	5

$^{1}/_{2}$ of £8 = £4.

8	
4	4

So $^{1}/_{4}$ of £20 is a larger amount.

E.g.

Which would you rather have: $^{2}/_{4}$ of £12 or $^{1}/_{2}$ of £12?

12	3
	3
	3
	3

12	6
	6

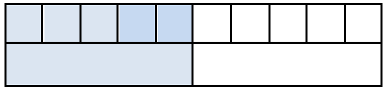
As 3 + 3 equals 6, $^{2}/_{4}$ of £6 and $^{1}/_{2}$ of £12 are equal.

Suggested Expectations at Y3

Equivalent fractions

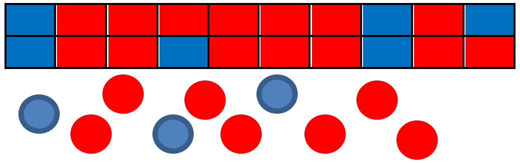
Recognise equivalent fractions with the use of diagrams.

E.g. $^{5}/_{10} = {}^{1}/_{2}$

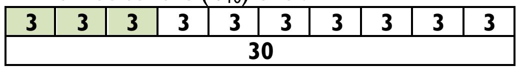


Tenths

Identify one tenth ($^{1}/_{10}$) of a shape, quantity or number, then use this to find $^{3}/_{10}$, $^{7}/_{10}$, etc. Links to multiplication should be made here.

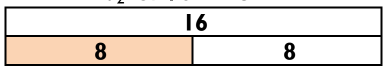


Find three tenths ($^{3}/_{10}$) of 30 = 9

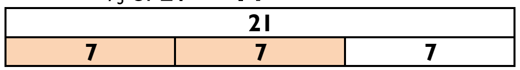


Compare halves, thirds, quarters and tenths of a given quantity.
E.g. Which is smallest?

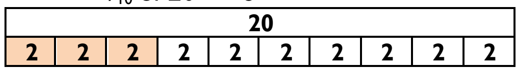
- $^{1}/_{2}$ of 16 = **8**



- $^{2}/_{3}$ of 21 = **14**



- $^{3}/_{10}$ of 20 = **6**

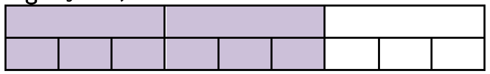


Suggested Expectations at Y4

Equivalent fractions

Recognise equivalent fractions with the use of diagrams with denominators less than 12.

E.g. $^{2}/_{3} = {}^{6}/_{9}$

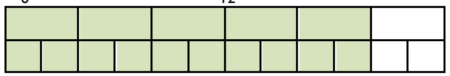


Order fractions with different denominators by finding a common denominator.

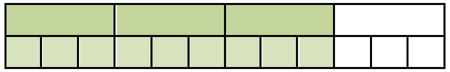
E.g. Add the correct symbol in the box to make the statement correct.

$^{5}/_{6}$ □ $^{3}/_{4}$

$^{5}/_{6}$ is the same as $^{10}/_{12}$



$^{3}/_{4}$ is the same as $^{9}/_{12}$



So $^{5}/_{6}$ $\boxed{>}$ $^{3}/_{4}$

Addition and subtraction of fractions with common denominators which cross the whole

Continue to practice addition of fractions with the same denominator (from suggested expectations at Y3).

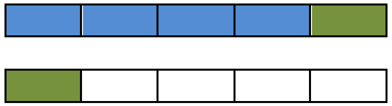
Suggested Expectations at Y5

Addition and subtraction of fractions with common denominators

Continue to use and practise Year 4 methods for the addition and subtraction of fractions with common denominators. Extend to give answers as mixed numbers.

E.g. $\frac{4}{5} + \frac{2}{5} = \frac{6}{5} = 1\frac{1}{5}$

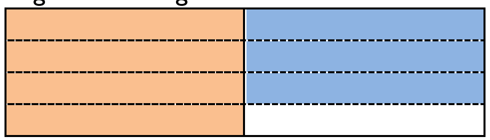
(because we have filled one whole bar and have 1 left over)



Extend to add and subtract fractions with different denominators where a common denominator must be found first, including simplification. Again, links should be made to multiplication and times tables.

E.g. $\frac{1}{2} + \frac{3}{8} = \frac{7}{8}$

Begin with a diagrammatical method



Then move to a written method

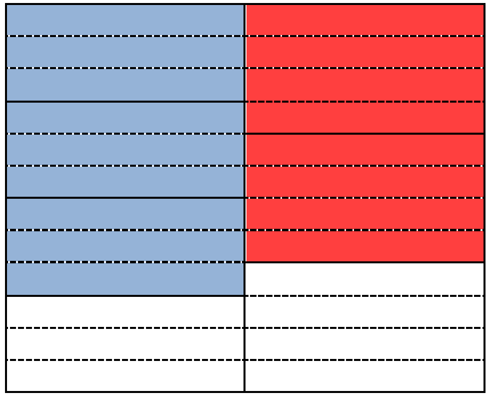
$$\frac{1}{2}\,\substack{\times 4\\ \\ \times 4} + \frac{3}{8} = \frac{4}{8} + \frac{3}{8} = \frac{7}{8}$$

Suggested Expectations at Y6

Addition and subtraction of fractions

Continue to use and practise Year 5 pictorial and formal written methods for addition and subtraction of fractions.

E.g. $\underset{\times 3}{\frac{3}{4}} + \underset{\times 4}{\frac{2}{3}} = \frac{9}{12} + \frac{8}{12} = \frac{17}{12} = 1\frac{5}{12}$



Extend to the addition and subtraction of mixed numbers.

Method 1: Keep ones and fractions separate

E.g. $\frac{2}{3} + 1\frac{5}{8}$

$= 1 + \underset{\times 8}{\frac{2}{3}} + \underset{\times 3}{\frac{5}{8}}$

$= 1 + \frac{16}{24} + \frac{15}{24}$

$= 1 + \frac{31}{24}$

$= 1 + 1 + \frac{7}{24} = 2\frac{7}{24}$

__Addition and subtraction of fractions with common denominators (where the sum is less than a whole)__

Identify what must be added to one fraction to make a whole.

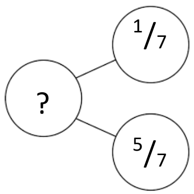
E.g. $\frac{1}{4} + \frac{3}{4} = \frac{4}{4}$

or

Extend to the addition of fractions with the same denominator, not bridging the whole.

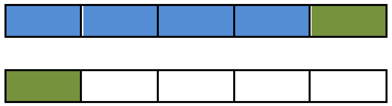
E.g. $\frac{1}{7} + \frac{5}{7} = \frac{6}{7}$

Or

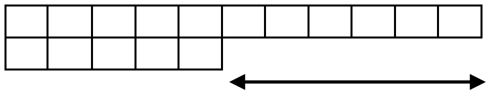


Extend to adding fractions when the whole is bridged (conversion to mixed numbers not necessary).

E.g. $\frac{4}{5} + \frac{2}{5} = \frac{6}{5}$



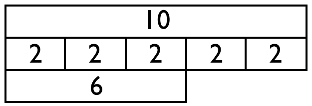
E.g. $\frac{11}{8} - \frac{5}{8} = \frac{6}{8}$



Difference is $^{6}/_{8}$

__Finding fractions of quantities.__

E.g. Find $\frac{3}{5}$ of 10



Or

$\frac{1}{5}$ of 10 = 10 ÷ 5 = 2

So $\frac{3}{5}$ of 10 = 3 x 2 = 6

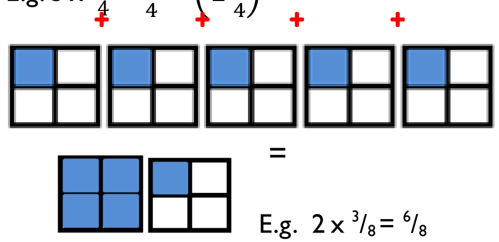
Students should be able to verbalise and record their reasoning in a variety of ways.

E.g. $\frac{13}{18} - \underset{x\,2}{\overset{x\,2}{\frac{2}{9}}} = \frac{13}{18} - \frac{4}{18} = \frac{9}{18} = \frac{1}{2}$

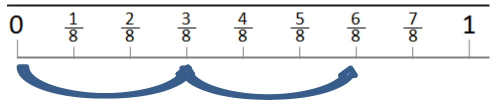
__Multiplication__

Multiply a single fraction by a whole number using either method shown below.
The link between repeated addition and multiplication should be made.

E.g. $5 \times \frac{1}{4} = \frac{5}{4} = \left(1\frac{1}{4}\right)$



E.g. $2 \times {}^{3}/_{8} = {}^{6}/_{8}$



Multiply a mixed number by a whole number.
Begin with a pictorial method.

Method 2: Turn any mixed numbers into improper fractions first

E.g. $1\frac{5}{8} - \frac{2}{3}$

$= \underset{x\,3}{\frac{13}{8}} - \underset{x\,8}{\frac{2}{3}}$

$= \frac{39}{24} - \frac{16}{24}$

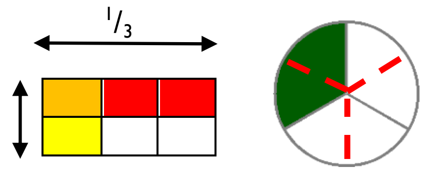
$= \frac{23}{24}$

__Multiplying fractions__

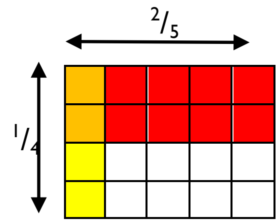
Continue to practise Year 5 written methods for multiplying a single fraction by a whole number.

Multiply two proper fractions.
Begin with a pictorial method.

E.g. $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

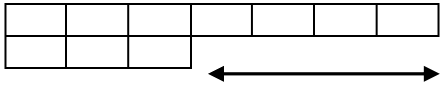


E.g. $\frac{2}{5} \times \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$



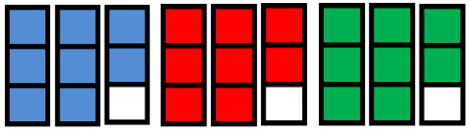
E.g. $\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$
(simplification not always necessary)

Or



Difference is $^4/_8$

E.g. $3 \times 2\frac{2}{3} = 8$



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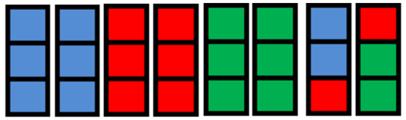


Once the pupils are confident, extend to a formal written method.
E.g.

$3 \times 2\frac{2}{3}$

$3 \times 2 = 6$

$3 \times \frac{2}{3} = \frac{6}{3} = 2$

$6 + 2 = 8$

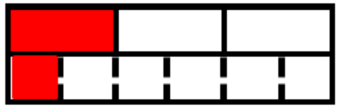
Once the pupils are confident, extend to a formal written method.

E.g. $\frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$

In worded problems students may be asked to find ¾ of ½ .
They should understand "of" means multiply.
E.g. $\frac{3}{4}$ of $\frac{1}{2} = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

<u>Dividing proper fractions by whole numbers</u>

E.g. $\frac{1}{3} \div 2 = \frac{1}{6}$



E.g. $\frac{2}{5} \div 3 = \frac{6}{15} \div 3 = \frac{2}{15}$