Hampton Hargate Primary School

Mathematics Calculation Policy

Date: APRIL 2023
Review date: APRIL 2025

Hampton Hargate Primary School believes that all children, regardless of ability and behaviour are valued equally. Groups of pupils (eg. SEND pupils, children in care, EAL pupils etc) are not viewed as separate but are part of the whole school approach. Different children's needs are recognised and met through varied and flexible provision and the use of different styles of teaching and learning throughout the curriculum. Every Child Matters (ECM) is an important part of the school ethos and we encourage all staff, governors, visitors, helpers etc to play their part in promoting this. This policy therefore applies to all our children, regardless of their gender, faith, race, culture, family circumstances or sexuality.

This school is committed to safeguarding and promoting the welfare and safety of all children and expects all staff to share in this commitment. All staff must follow the guidelines set out in the relevant section of **myconcern®** which is available online.

This policy outlines both the manipulatives and representations that support the **mental** and **written** methods that should be taught from EYFS to Year 6. It has been written according to the National Curriculum 2014 and the written calculations for all four operations are exemplified in this policy.

The document highlights the connections within mathematics and outlines the progression for addition, subtraction, multiplication and division.

Where possible **addition and subtraction** should be taught together, as should **multiplication and division,** to ensure children are able to see the clear links between the operations and the inverse nature of them.

Children will become fluent, reason mathematically and solve problems by applying knowledge rapidly and accurately, using mathematical language and persevering in seeking solutions. (NC 2014) Children should look at the calculation and decide which strategy to use, being able to explain and reason why they have chosen a strategy and whether it is the most efficient.

When teaching calculations that require a written method, the method should be presented and explained to the children alongside manipulatives and representations, such as counting apparatus and place value counters, to ensure children have a conceptual understanding of the written method and can 'see' the maths and make sense of what is happening. This policy encourages the use of a CPA approach, using concrete manipulatives, pictorial representations and abstract visualisation to make connections and develop procedural fluency and conceptual understanding in parallel. The children will suggest ways to explore and record work, whilst investigating the four operations.

This policy outlines the **written methods** in line with the National Curriculum 2014 and suggests that:

- Children look at a calculation and decide whether it can be done mentally, mentally with a jotting or whether it needs a written method.
- **Children should be introduced to the agreed written methods with place value apparatus alongside, to ensure they are clear about the value of the numbers with which they are calculating.**
- Children should use their number sense to estimate, calculate and check, ensuring that the answer they generate is a plausible one.
- For the purpose of developing understanding, children should explain their mental calculations (verbally and written) using precise vocabulary and mathematical stem sentences alongside representations that show their thinking.

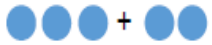
EYFS Calculation Policy

Addition

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

Foundation Stage

1. Have an understanding of what "more" means and be able to say what is one more than a given number.
2. Children begin to combine groups of objects or pictures and use concrete apparatus.



3. Solve simple problems using fingers and introduce Numicon when appropriate.

2 + 5 = 7

4. Children make a record in pictures, words, Numicon shapes or symbols of addition activities already carried out.

2 + 2 = 4

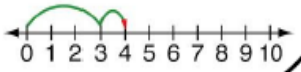
5 + 1 = 6

5. Children are encouraged to read number sentences aloud in different ways:

   e.g. "Three add two equals 5" "Four plus 3 makes 7"

6. Construct number sentences verbally, or by using cards to go with practical activities.
7. Number lines can be used alongside practical apparatus to solve addition calculations and word problems. Children "jump" along the number line to "count on".

3 + 1 = 4



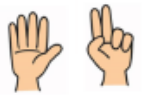
Subtraction

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

Foundation Stage

1. Have an understanding of what "less" means and be able to say what is one less than a given number.
2. Children begin to use objects, pictures and concrete apparatus to relate subtraction to taking away and counting how many objects are left.
3. Solve simple problems using fingers and introduce Numicon where appropriate.

5 – 1 = 4



5 – 3 = 2

4. Children make a record in pictures, words, Numicon shapes or symbols of subtraction activities already carried out.

10 take away 5 leaves 5

5. Children are encouraged to read number sentences aloud in different ways

   e.g. "Five subtract one leaves four" "Six take away 3 equals 3"

6. Construct number sentences verbally or using cards to go with practical activities.
7. Number lines can be used alongside practical apparatus to solve subtraction calculations and word problems "jump" back to "count down" the number line.

5 – 4 = 1

Multiplication

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

Foundation Stage

The link between addition and multiplication can be introduced through doubling and reinforced through repeated addition of the same number.

1. Children begin with mostly pictorial representations.

How many groups of 2 are there? 3 groups of 2 = 6

2. Real life contexts and use of practical equipment to count in repeated groups of the same size.

How many wheels are there altogether?

How much money do I have?

3. Count in twos, fives and tens, both aloud and with objects, such as Numicon or other concrete apparatus.

2, 4, 6, 8,10, 12

4. Children are encouraged to read number sentences aloud in different ways
   e.g. "Five groups of two makes ten" "Three lots of two makes six"

5. Children are given multiplication problems set in a real life context and are encouraged to visualise the problem.
   e.g. "How many fingers on two hands?" "How many sides on three triangles?"

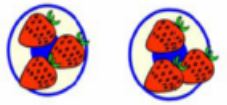
"How many legs on four ducks?"

Division

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

Foundation Stage

1. Division can be introduced through halving or sharing an equal amount into 2 groups.



2. Children begin with mostly pictorial representations linked to real life contexts:

Grouping Model
Mum has 6 socks. She grouped them into pairs. How many pairs did she make?

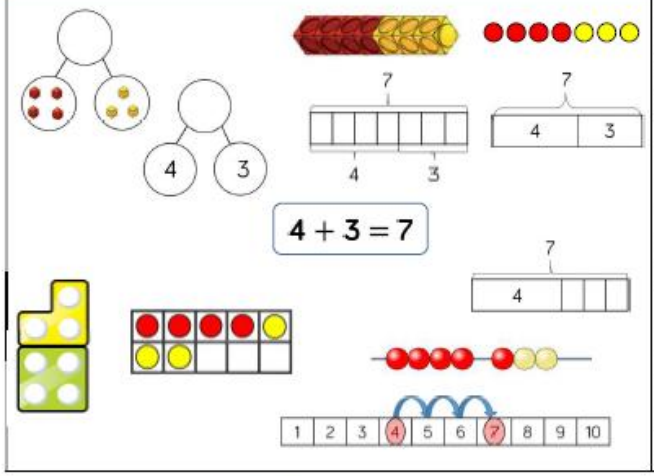
Sharing Model
I have 10 sweets. I want to share them with my friend. How many will we have each?

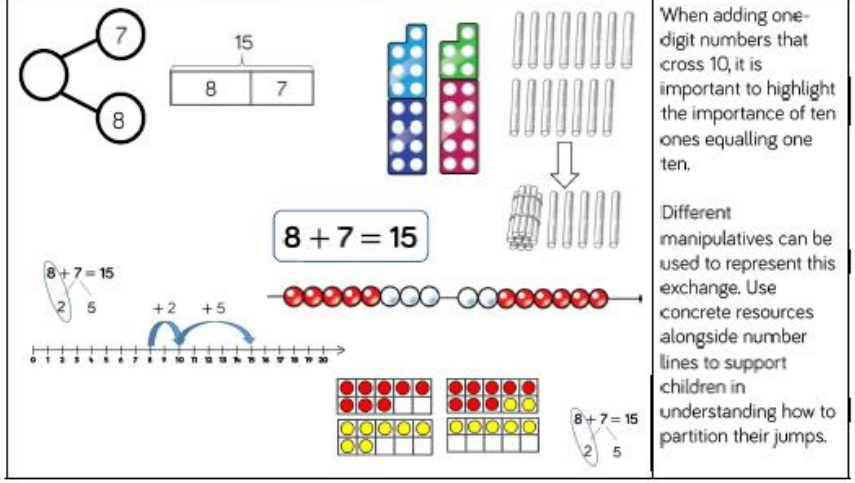
Children need to see and hear representations of division as both grouping and sharing.

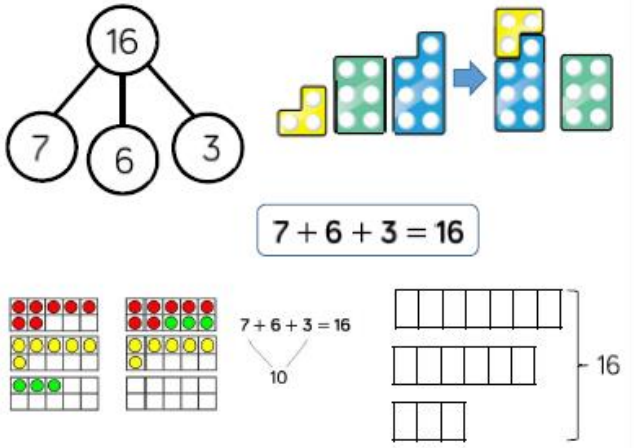
3. Children have a go at recording the calculation that has been carried out:
   e.g. by drawing pictures in groups or by arranging concrete apparatus into groups.

12 shared equally by 3 is 4

Addition

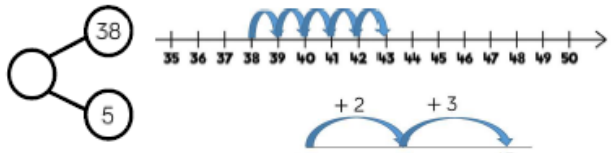
Skill: Add 1-digit numbers within 10	Year: 1
	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.

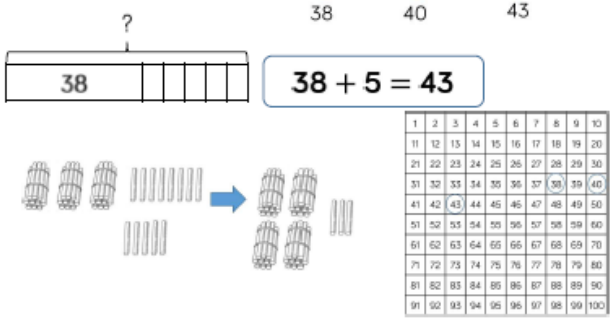
Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
	When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

Skill: Add three 1-digit numbers	Year: 2
	When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

Skill: Add 1-digit and 2-digit numbers to 100

Year: 2/3





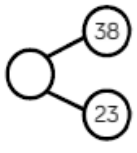
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

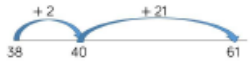
They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43.

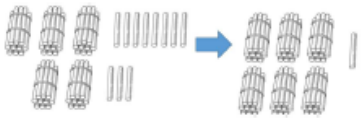
Hundred squares and straws can support children to find the number bond to 10.

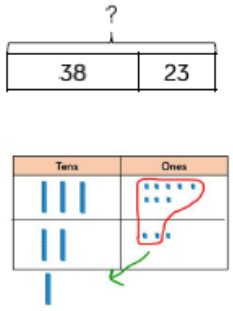
Skill: Add two 2-digit numbers to 100

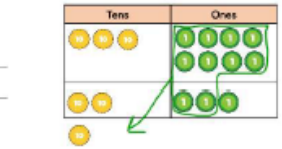
Year: 2/3









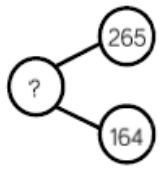


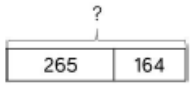
At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

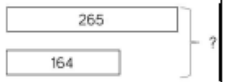
Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

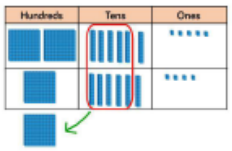
Skill: Add numbers with up to 3 digits

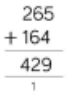
Year: 3

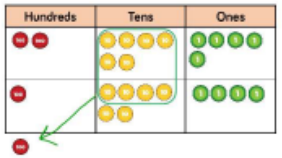












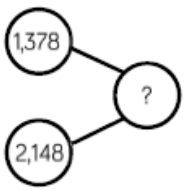
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

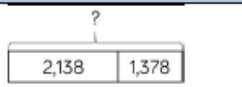
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

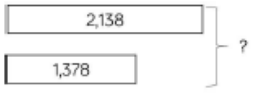
Plain counters on a place value grid can also be used to support learning.

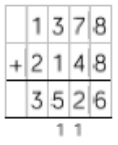
Skill: Add numbers with up to 4 digits

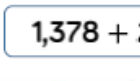
Year: 4

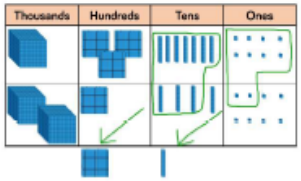


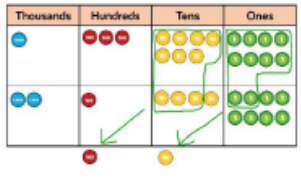








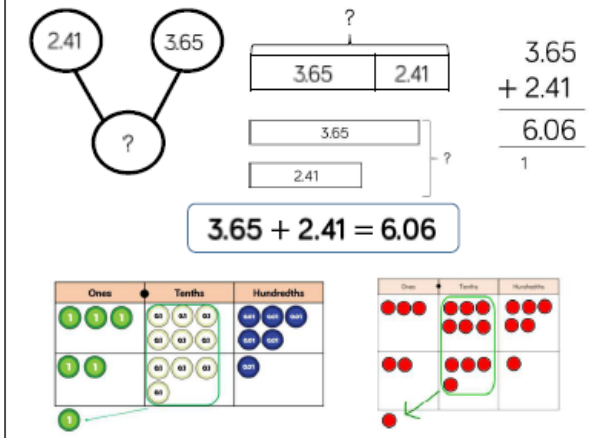


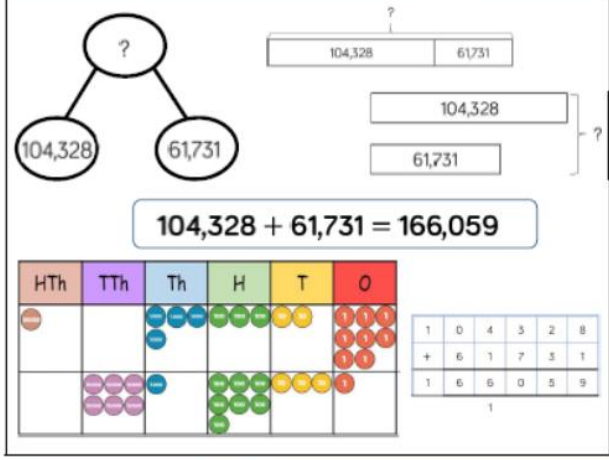


Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

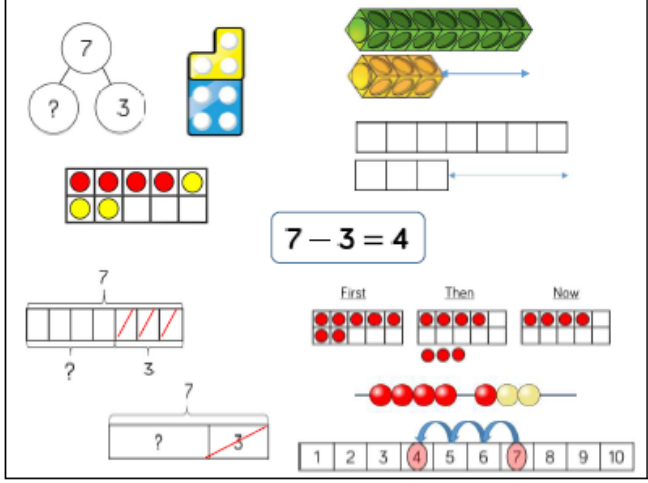
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

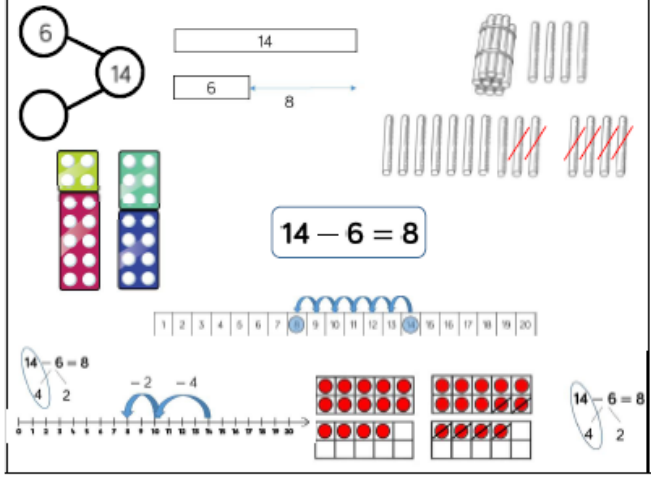
Plain counters on a place value grid can also be used to support learning.

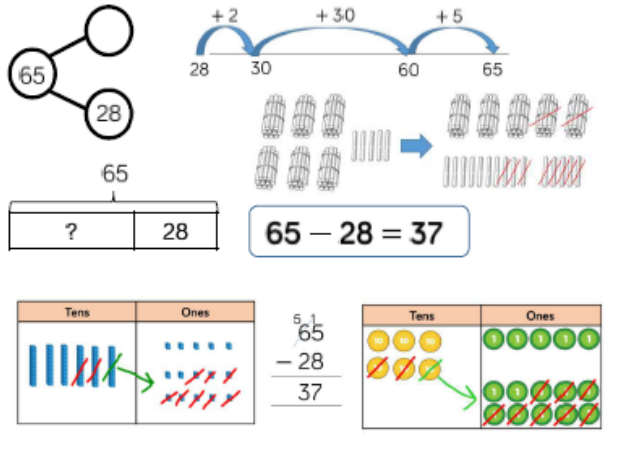
Skill: Add with up to 3 decimal places	Year: 5
	Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places. Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

Skill: Add numbers with more than 4 digits	Year: 5/6
	Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

Subtraction

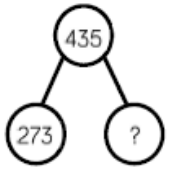
Skill: Subtract 1-digit numbers within 10	Year: 1
	Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.

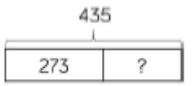
Skill: Subtract 1 and 2-digit numbers to 20	Year: 1/2
	When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

Skill: Subtract 1 and 2-digit numbers to 100	Year: 2/3
	At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

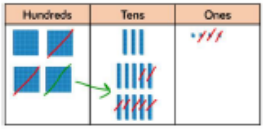
Skill: Subtract numbers with up to 3 digits

Year: 3

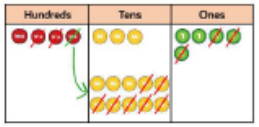




435 − 273 = 262



$$\begin{array}{r} {}^{3}\not{4}{}^{1}\not{3}5 \\ -\ 273 \\ \hline 262 \end{array}$$



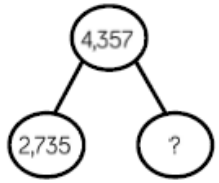
Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits.

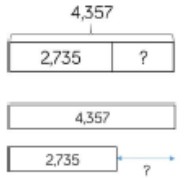
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Subtract numbers with up to 4 digits

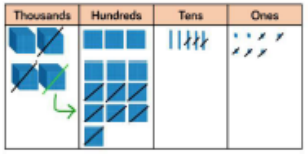
Year: 4

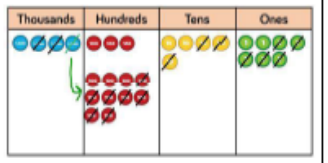




$$\begin{array}{r} {}^{3}\not{4}{}^{1}\not{3}57 \\ -\ 2735 \\ \hline 1622 \end{array}$$

4,357 − 2,735 = 1,622





Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

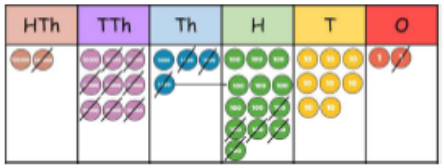
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Subtract numbers with more than 4 digits

Year: 5/6

294,382 − 182,501 = 111,881



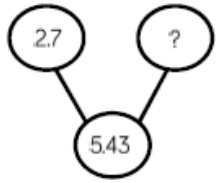
	2	9	$^{5}\not{4}$	$^{1}3$	8	2
−	1	8	2	5	0	1
	1	1	1	8	8	1

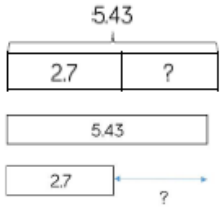
Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

Skill: Subtract with up to 3 decimal places

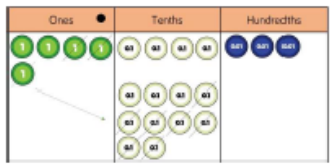
Year: 5

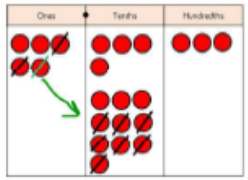




$$\begin{array}{r} {}^{4}\not{5}{}^{1}.43 \\ +\ 2.7 \\ \hline 2.73 \end{array}$$

5.43 − 2.7 = 2.73





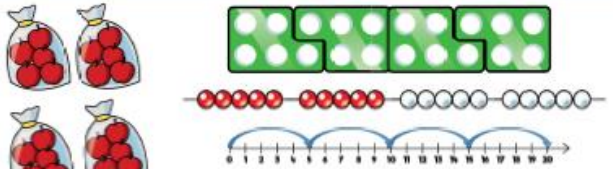
Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

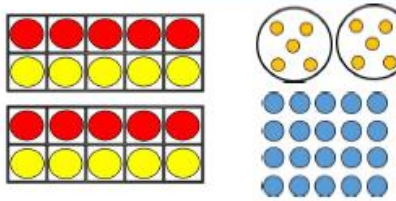
Multiplication

Skill: Solve 1-step problems using multiplication

Year: 1/2



One bag holds 5 apples.
How many apples do 4 bags hold?



$5 + 5 + 5 + 5 = 20$

$4 \times 5 = 20$

$5 \times 4 = 20$

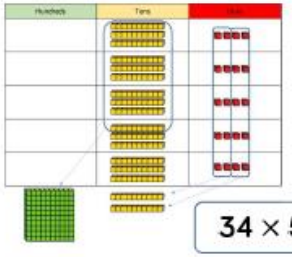
Children represent multiplication as repeated addition in many different ways.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

In Year 2, children are introduced to the multiplication symbol.

Skill: Multiply 2-digit numbers by 1-digit numbers

Year: 3/4



	H	T	O	
		3	4	
×			5	
		2	0	(5 × 4)
+	1	5	0	(5 × 30)
	1	7	0	

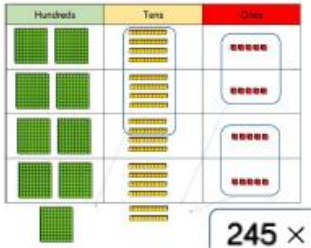
$34 \times 5 = 170$

	H	T	O
		3	4
×			5
	1	7	0
	1	2	

Teachers may decide to first look at the expanded column method before moving on to the short multiplication method.
The place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

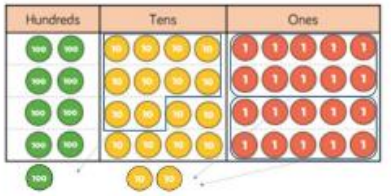
Skill: Multiply 3-digit numbers by 1-digit numbers

Year: 3/4



	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

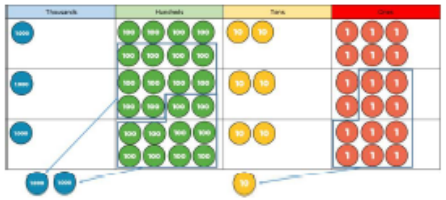
$245 \times 4 = 980$



When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.
Base 10 and place value counters continue to support the understanding of the written method.
Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Skill: Multiply 4-digit numbers by 1-digit numbers

Year: 5



$1{,}826 \times 3 = 5{,}478$

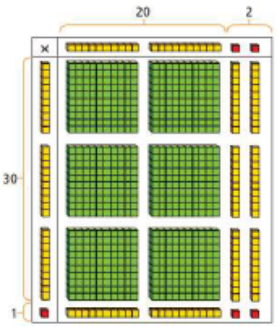
	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

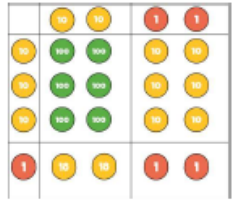
When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers

Year: 5





×	20	2
30	600	60
1	20	2

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

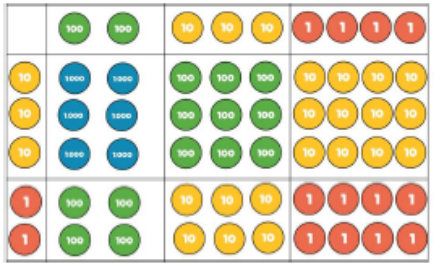
$22 \times 31 = 682$

When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.

The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

Skill: Multiply 3-digit numbers by 2-digit numbers

Year: 5



Th	H	T	O
	2	3	4
×		3	2
	4	6	8
1 7	1 0	2	0
7	4	8	8

×	200	30	4
30	6,000	900	120
2	400	60	8

$234 \times 32 = 7{,}488$

Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers.

Encourage children to move towards the formal written method, seeing the links with the grid method.

Skill: Multiply 4-digit numbers by 2-digit numbers

Year: 5/6

TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 2	1 5	9 3	1 7	2
1 5	4	7 1	8	0
7	6	6	9	2
		1		

$2{,}739 \times 28 = 76{,}692$

When multiplying 4-digits by 2-digits, children should be confident in the written method.

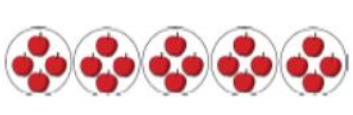
If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.

Consider where exchanged digits are placed and make sure this is consistent.

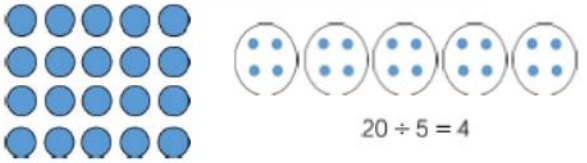
Division

Skill: Solve 1-step problems using multiplication (sharing)

Year: 1/2



There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?



$20 \div 5 = 4$

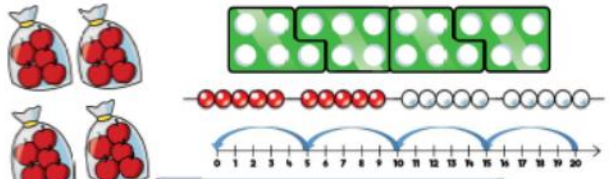
Children solve problems by sharing amounts into equal groups.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.

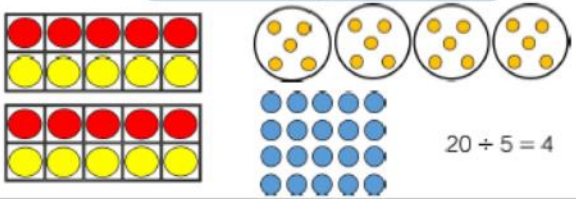
In Year 2, children are introduced to the division symbol.

Skill: Solve 1-step problems using division (grouping)

Year: 1/2



There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?

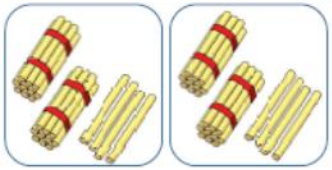


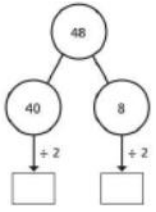
$20 \div 5 = 4$

Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

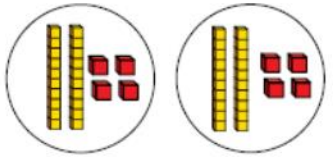
Skill: Divide 2-digits by 1-digit (sharing with no exchange)

Year: 1/2





$48 \div 2 = 24$



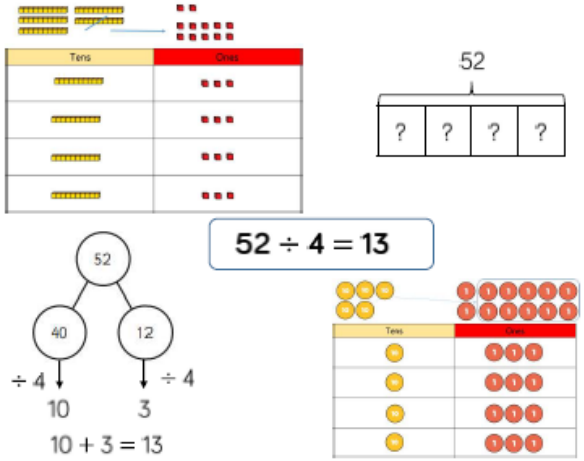
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

Straws, Base 10 and place value counters can all be used to share numbers into equal groups.

Part-whole models can provide children with a clear written method that matches the concrete representation.

Skill: Divide 2-digits by 1-digit (sharing with exchange)

Year: 3/4

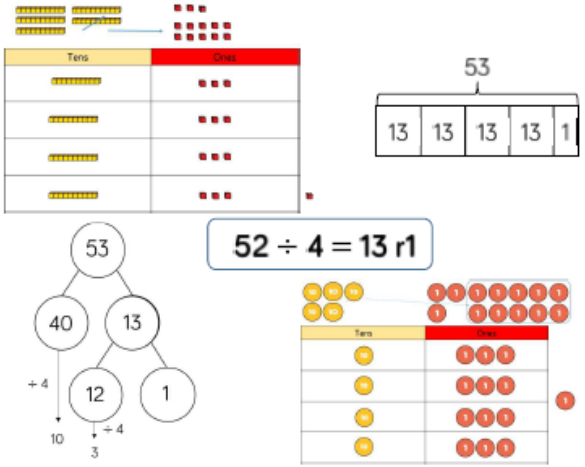


When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.
Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (sharing with remainders)

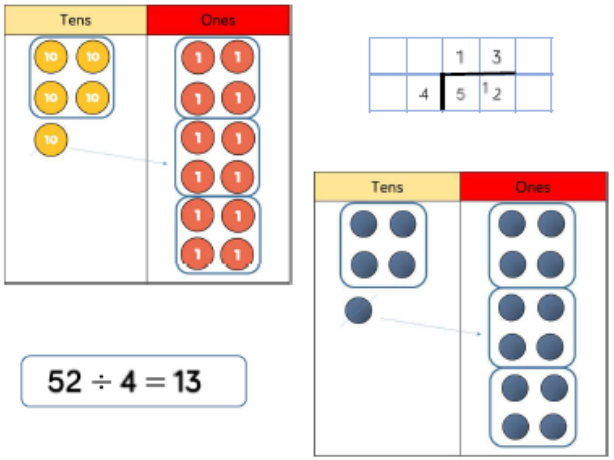
Year: 3/4



When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.
Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (grouping)

Year: 4/5



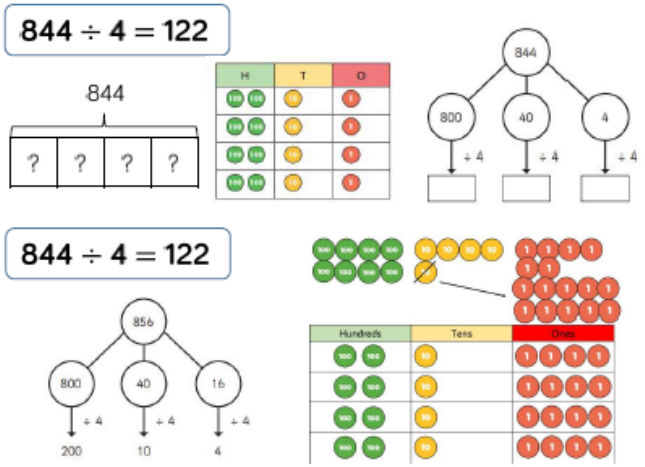
When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.

Skill: Divide 3-digits by 1-digit (sharing)

Year: 4

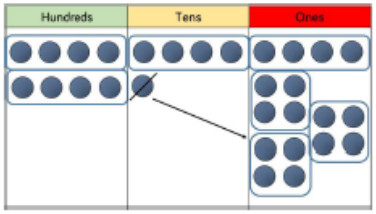


Children can continue to use place value counters to share 3-digit numbers into equal groups.
Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows.
This method can also help to highlight remainders.
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 3-digits by 1-digit (grouping)

Year: 5

		2	1	4
	4	8	5	$^{1}6$



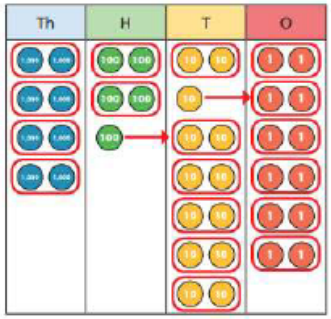
$856 \div 4 = 214$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4-digits by 1-digit (grouping)

Year: 5



	4	2	6	6
2	8	5	$^{1}3$	$^{1}2$

$8{,}532 \div 2 = 4{,}266$

Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

Skill: Divide multi digits by 2-digits (short division)

Year: 6

		0	3	6
	12	4	$^{4}3$	$^{7}2$

$432 \div 12 = 36$

$7{,}335 \div 15 = 489$

	0	4	8	9
15	7	$^{7}3$	$^{13}3$	$^{13}5$

15	30	45	60	75	90	105	120	135	150

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.