EPA CALCULATION POLICY 2021- BY CALCULATION

ABRIDGED VERSION

Mathematic Mastery

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems.

Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

Mathematical Language

The 2014 National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning (reasoning). Indeed, in certain year groups, the non-statutory guidance highlights the requirement for children to extend their language around certain concepts. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate and precise mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers only accepting what is correct.

> The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof.
>
> *2014 Maths Programme of Study*

How to Use the Policy

This mathematics policy is a guide for all staff at EPA schools and has been adapted from work by the White Rose HUB. It is purposely set out as a progression of mathematical skills and year group phases but a flexible approach to teaching and learning is needed according to the cohort and individual needs. It is expected that teachers will use their professional judgement as to when consolidation of existing skills is required or if to move onto the next concept. However, the focus must always remain on breadth and depth rather than accelerating through concepts. Children should not be extended with new learning before they are ready, they should deepen their conceptual understanding by tackling challenging and varied problems.

All teachers use the scheme of work from the White Rose Maths Hub and are required to base their planning around their year groups modules and not to move onto a higher year groups scheme of work. Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used. For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

Concrete, Pictorial, Abstract Key

Concrete, Pictorial, Abstract Key

The policy has been adapted from the White Rose Hub's latest policy (2021) which splits each operation into concrete, pictorial and abstract teaching methodology.

This key will aid teachers in deciding which method to use first to build on successive skills. Generally concrete methods are taught first to build confidence in methodology, then pictorial methods second and finally abstract. However where teachers start will depend on the confidence and ability of the class to grasp abstract concepts.

Addition

Skill	Year	Representations and models	
Add two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Add 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead strings (20) Number tracks Number lines (labelled) Straws
Add three 1-digit numbers	2	Part-whole model Bar model	Ten frames (within 20) Number shapes
Add 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square

Skill	Year	Representations and models	
Add two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws	Base 10 Place value counters Column addition
Add with up to 3-digits	3	Part-whole model Bar model	Base 10 Place value counters Column addition
Add with up to 4-digits	4	Part-whole model Bar model	Base 10 Place value counters Column addition
Add with more than 4 digits	5	Part-whole model Bar model	Place value counters Column addition
Add with up to 3 decimal places	5	Part-whole model Bar model	Place value counters Column addition

Skill: Add 1-digit numbers within 10

Representation

Methodology

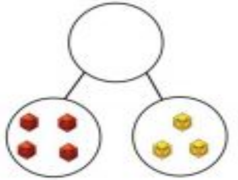
Year: 1

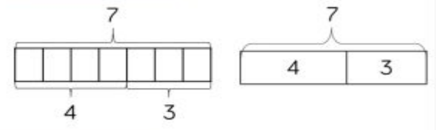
When adding numbers to 10, children can explore both aggregation and augmentation.

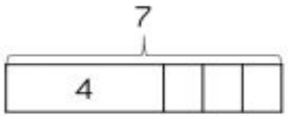
The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation.

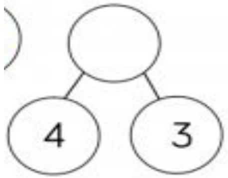
The combination bar model, ten frame, bead string and number track all support augmentation.

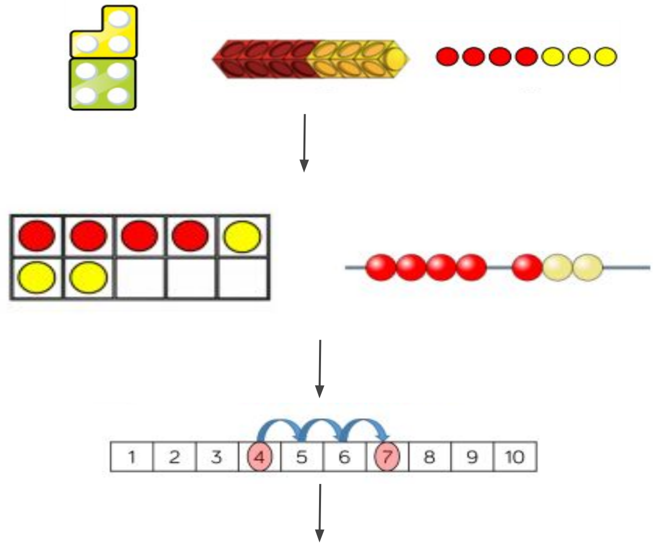
<u>Calculation:</u>
4 + 3 =











4 + 3 = 7

Skill: Add 1 and 2-digit numbers to 20

Representation

Methodology

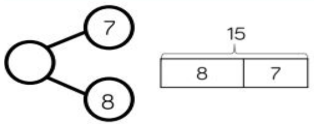
Year: 1/2

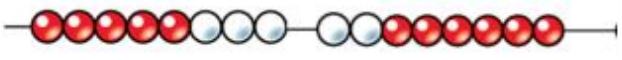
When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

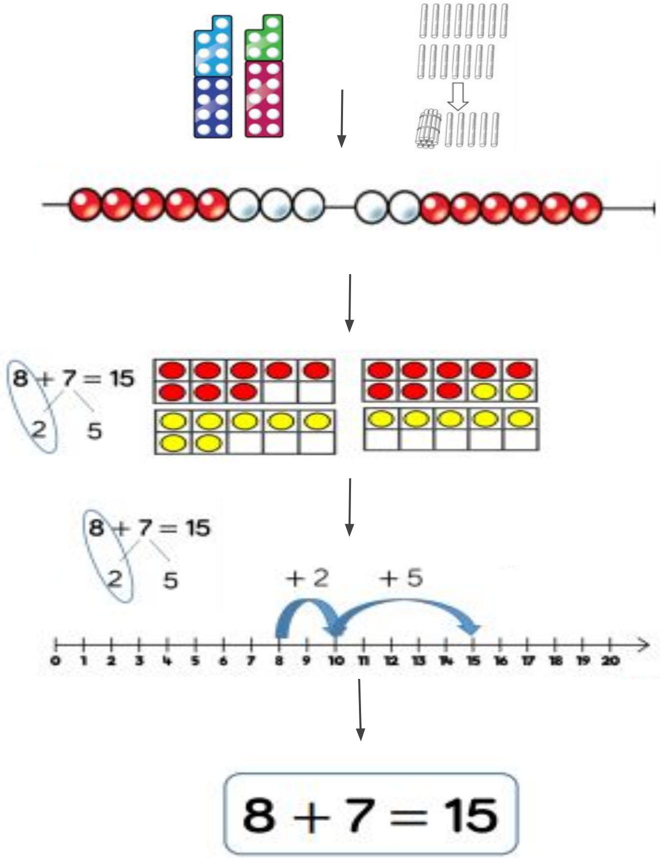
Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

<u>Calculation:</u>

8 + 7 =







Skill: Add three 1-digit numbers

Representation

Methodology

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.

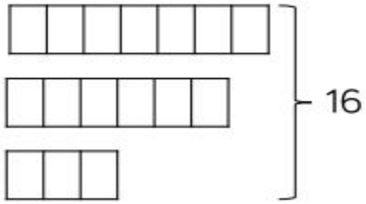
This supports children in their understanding of commutativity.

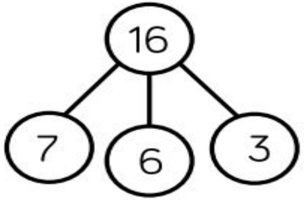
Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

Representation

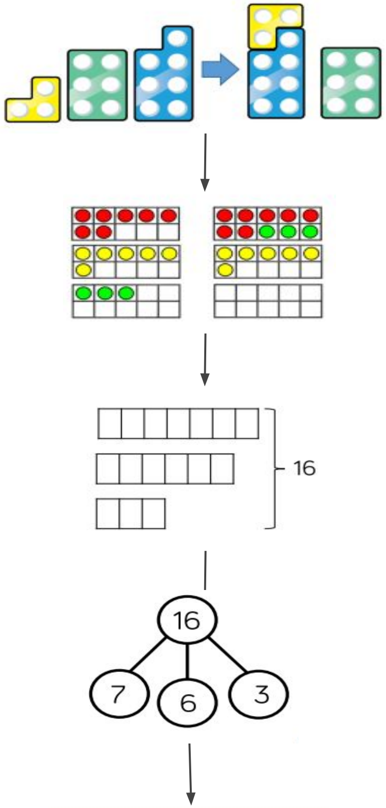
Calculation:

7 + 6 + 3 =





Methodology



7 + 6 + 3 = 16

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

Representation

Methodology

Year: 2/3

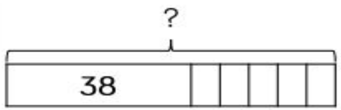
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

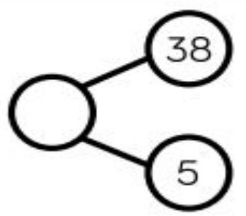
They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43.

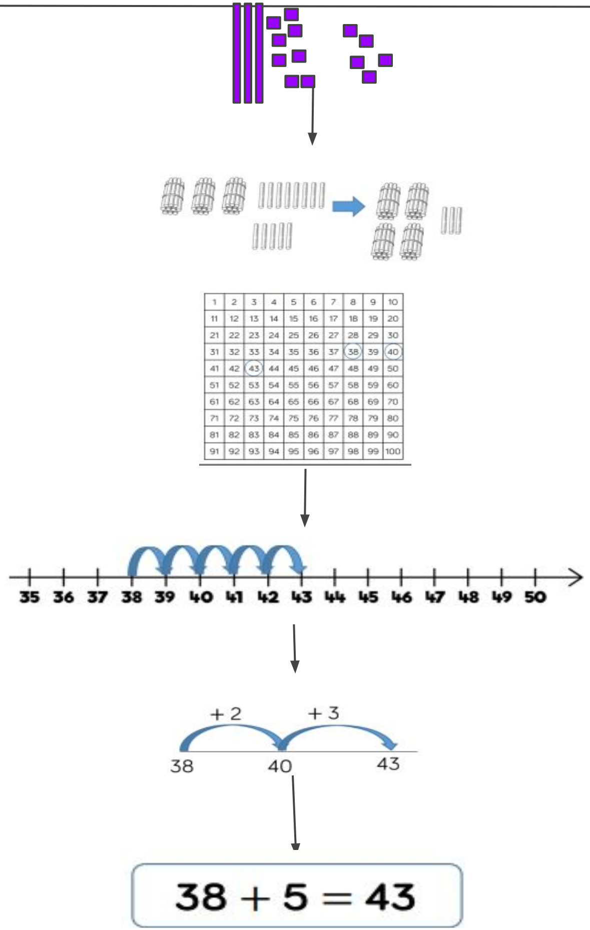
Hundred squares and straws can support children to find the number bond to 10.

<u>Calculation:</u>

38 + 5 =







Skill: Add two 2-digit numbers to 100

Representation

Methodology

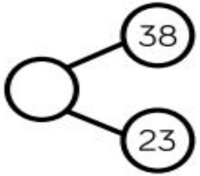
Year: 2/3

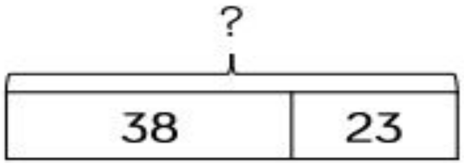
At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

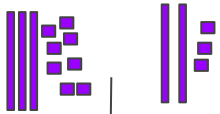
Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

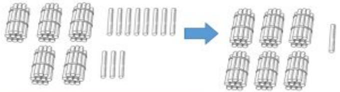
<u>Calculation:</u>

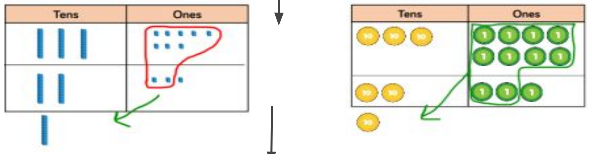
38 + 23 = 61

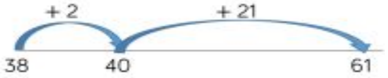













```
  38
+ 23
----
  61
----
  1
```

Skill: Add numbers with up to 3 digits

Representation

Methodology

Year: 3

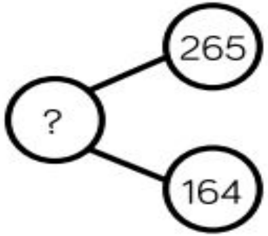
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

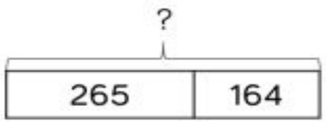
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

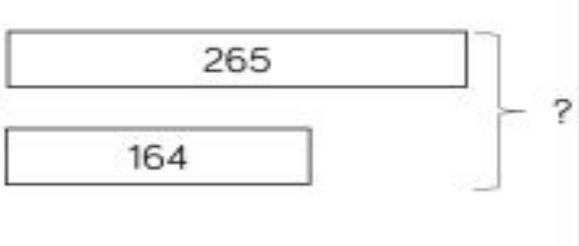
Plain counters on a place value grid can also be used to support learning.

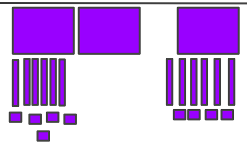
<u>Calculation:</u>

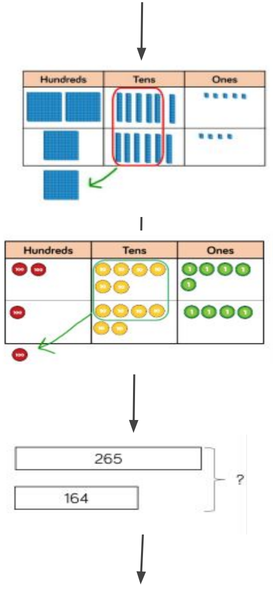
265 + 164 = 429












```
  265
+ 164
  429
  1
```

Skill: Add numbers with up to 4 digits

Representation

Methodology

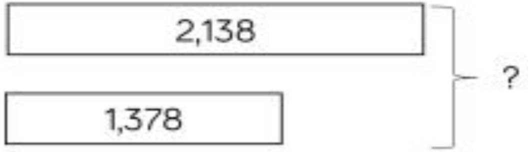
Year: 4

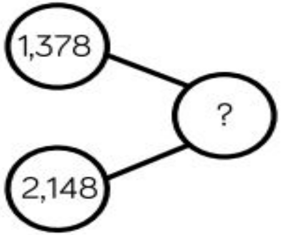
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

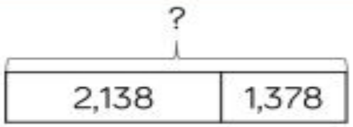
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

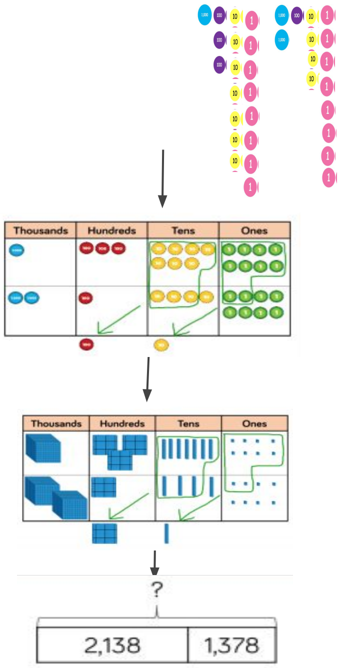
Plain counters on a place value grid can also be used to support learning.

<u>Calculation:</u>
1378 + 2148 = 3526









	1	3	7	8
+	2	1	4	8
	3	5	2	6
		1	1	

Skill: Add numbers with more than 4 digits

Representation

Methodology

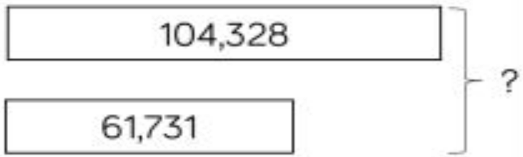
Year: 5/6

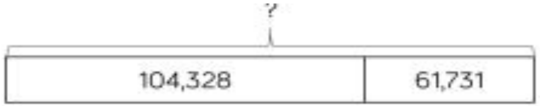
Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

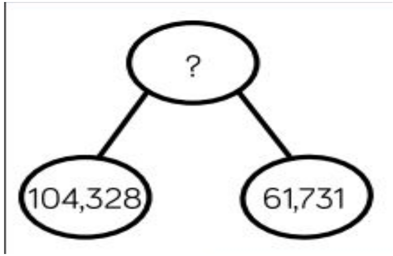
At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

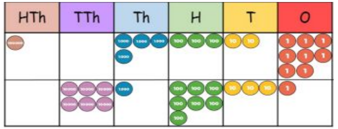
<u>Calculation:</u>

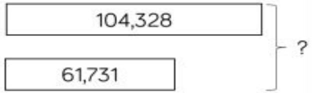
104,328 + 61,731 = 166,059

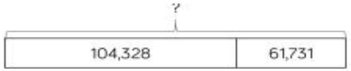


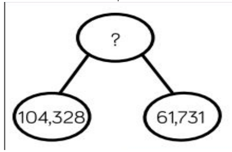












1	0	4	3	2	8
+	6	1	7	3	1
1	6	6	0	5	9
		1			

Skill: Add with up to 3 decimal places

Representation

Methodology

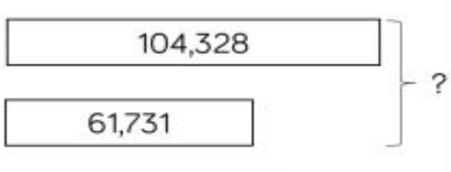
Year: 5

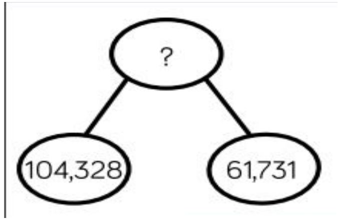
Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

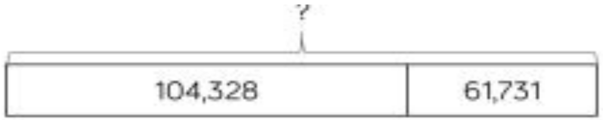
Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

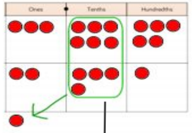
<u>Calculation:</u>

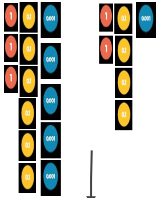
3.65 + 2.41 = 6.06

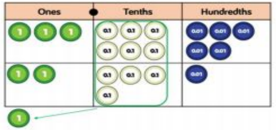


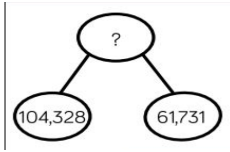


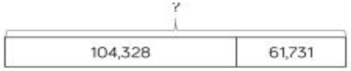












1	0	4	3	2	8
+	6	1	7	3	1
1	6	6	0	5	9
		1			

Subtraction

Skill	Year	Representations and models	
Subtract two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Subtract 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead string (20) Number tracks Number lines (labelled) Straws
Subtract 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square
Subtract two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws	Base 10 Place value counters Column addition

Skill	Year	Representations and models	
Subtract with up to 3-digits	3	Part-whole model Bar model	Base 10 Place value counters Column addition
Subtract with up to 4-digits	4	Part-whole model Bar model	Base 10 Place value counters Column addition
Subtract with more than 4 digits	5	Part-whole model Bar model	Place value counters Column addition
Subtract with up to 3 decimal places	5	Part-whole model Bar model	Place value counters Column addition

Skill: Subtract 1-digit numbers within 10

Representation

Methodology

Year: 1

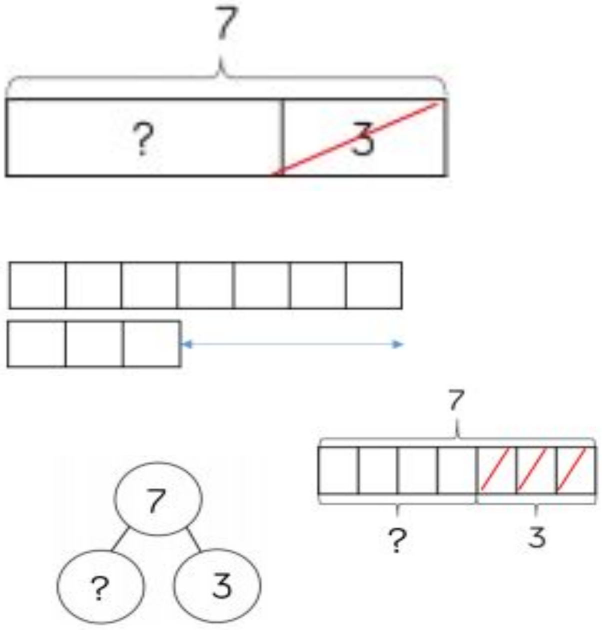
Part-whole models, bar models, ten frames and number shapes support partitioning.

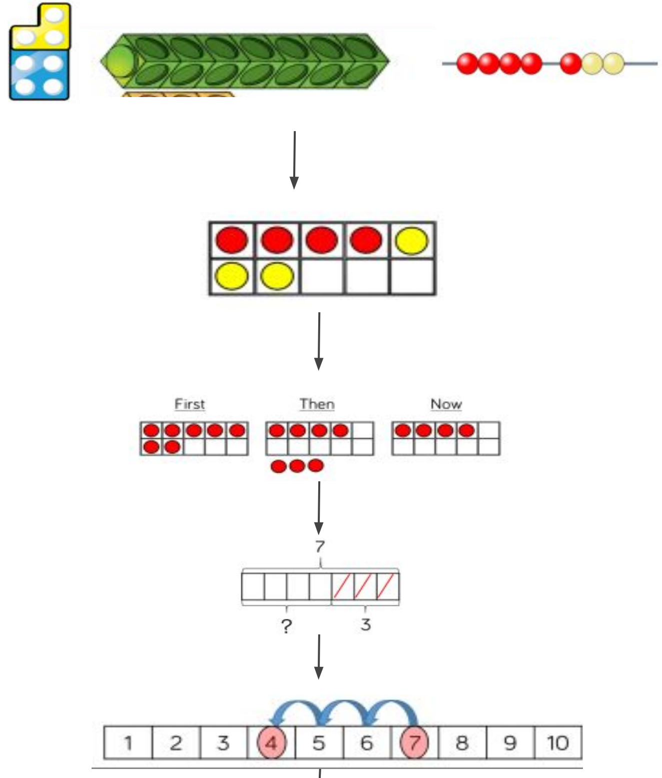
Ten frames, number tracks, single bar models and bead strings support reduction.

Cubes and bar models with two bars can support finding the difference.

<u>Calculation:</u>

7 - 3 = 4





$$7 - 3 = 4$$

Skill: Subtract 1 and 2-digit numbers to 20

Representation

Methodology

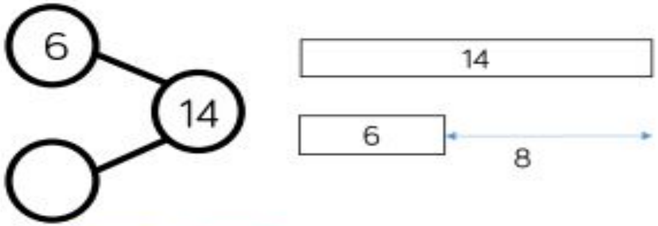
Year: 1/2

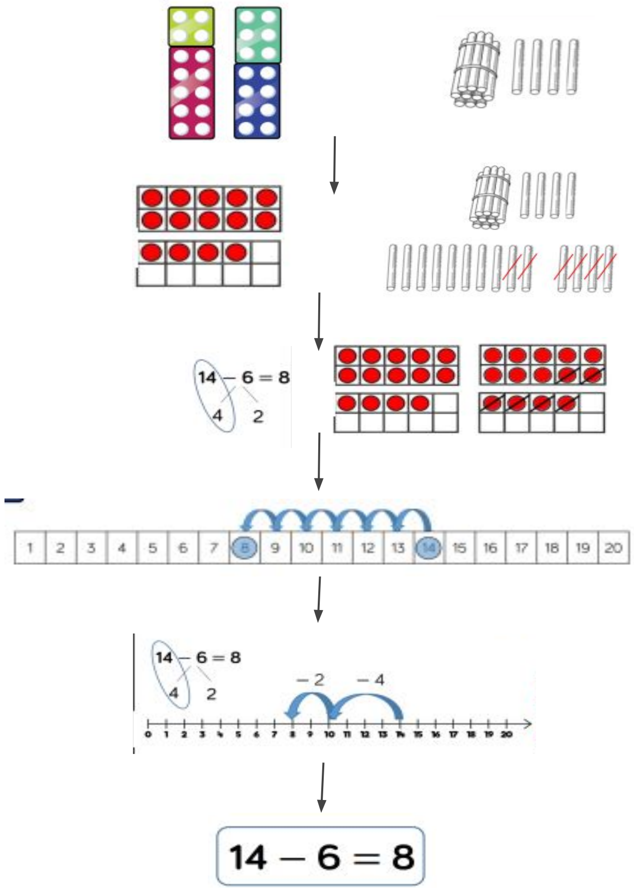
When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

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.

Calculation:

14 - 6 = 8





Skill: Subtract 1 and 2-digit numbers to 100

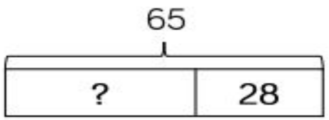
Year: 2

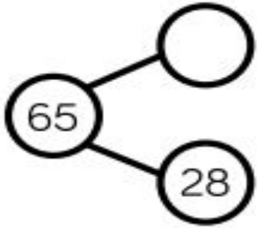
At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

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.

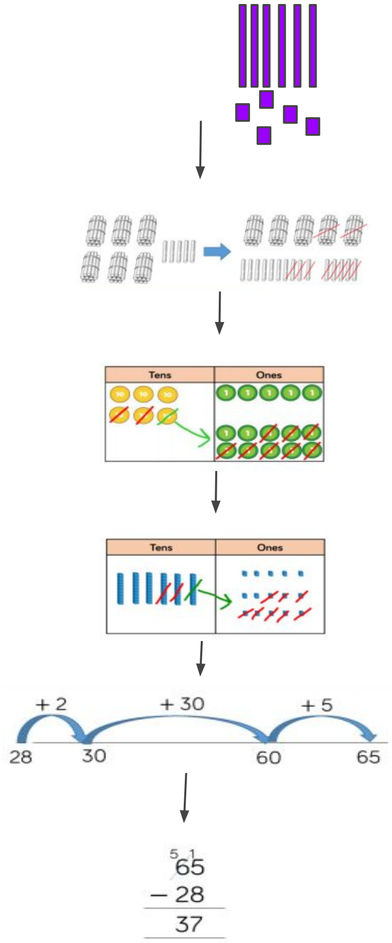
Representation

<u>Calculation:</u>
65 - 28 = 37





Methodology



Skill: Subtract numbers with up to 3 digits

Year: 3

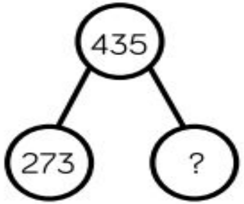
Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits.

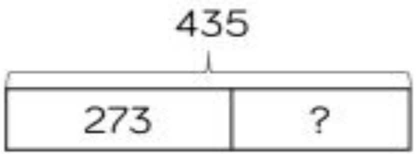
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

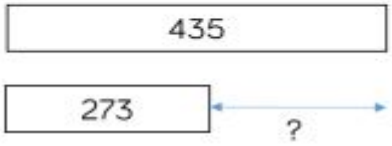
Plain counters on a place value grid can also be used to support learning.

Representation

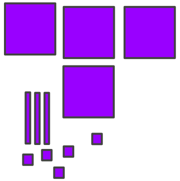
<u>Calculation:</u>
435 - 273 = 262

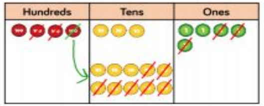


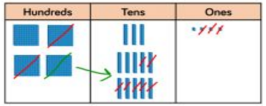


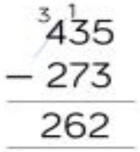


Methodology









Skill: Subtract numbers with up to 4 digits

Year: 4

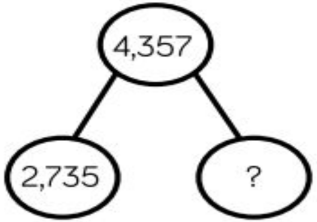
Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

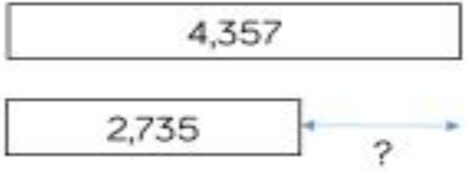
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

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

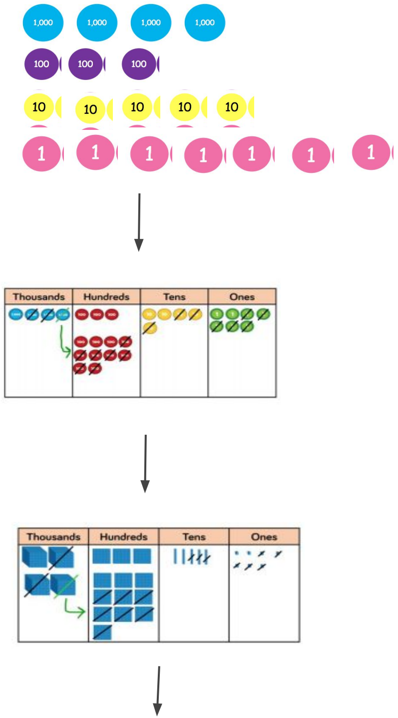
Representation

Calculation:
4,357 - 2,735 = 1,622





Methodology



$$\begin{array}{r} \overset{3}{\cancel{4}}\overset{1}{3}57 \\ -\ 2735 \\ \hline 1622 \\ \hline \end{array}$$

Skill: Subtract with up to 3 decimal places

Representation

Methodology

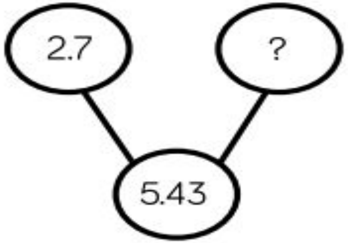
Year: 5

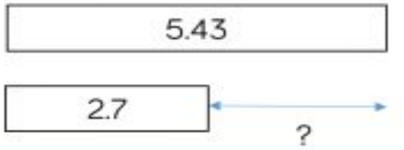
Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

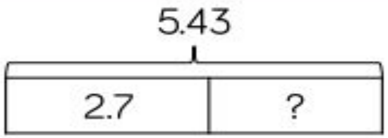
Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

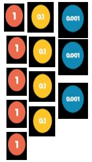
<u>Calculation:</u>

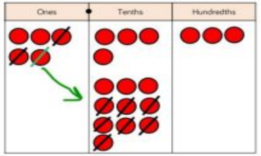
5.43 - 2.7 = 2.73

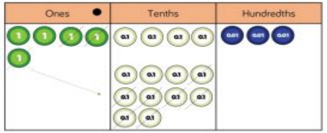


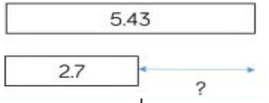












$$\begin{array}{r} {}^{4}\cancel{5}.{}^{1}43 \\ -\ 2.7 \\ \hline 2.73 \\ \hline \end{array}$$

Skill: Subtract numbers with more than 4 digits

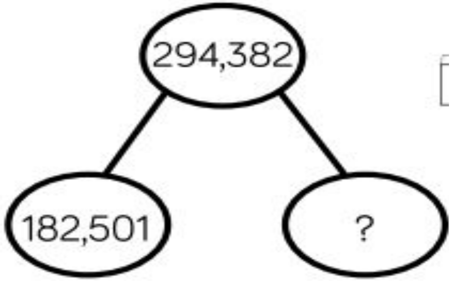
Year: 5/6

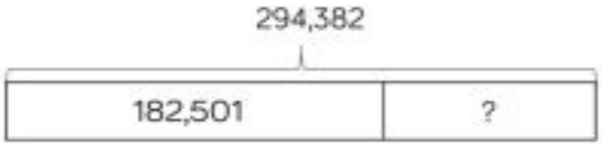
Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

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

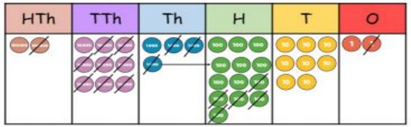
Representation

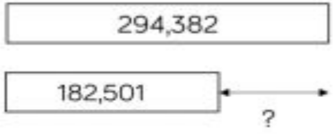
Calculation:
294,382 - 182,501 = 11,881





Methodology





	2	9	3~~4~~	13	8	2
−	1	8	2	5	0	1
	1	1	1	8	8	1

Multiplication

Skill	Year	Representations and models	
Solve one-step problems with multiplication	1/2	Bar model Number shapes Counters	Ten frames Bead strings Number lines
Multiply 2-digit by 1-digit numbers	3/4	Place value counters Base 10	Short written method Expanded written method
Multiply 3-digit by 1-digit numbers	4	Place value counters Base 10	Short written method
Multiply 4-digit by 1-digit numbers	5	Place value counters	Short written method

Skill	Year	Representations and models	
Multiply 2-digit by 2-digit numbers	5	Place value counters Base 10	Short written method Grid method
Multiply 2-digit by 3-digit numbers	5	Place value counters	Short written method Grid method
Multiply 2-digit by 4-digit numbers	5/6	Formal written method	

Skill: Solve 1-step problems using multiplication

Representation

Methodology

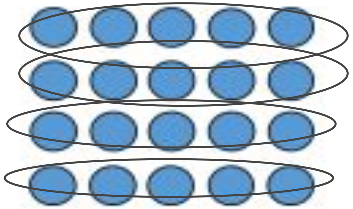
Year: 1/2

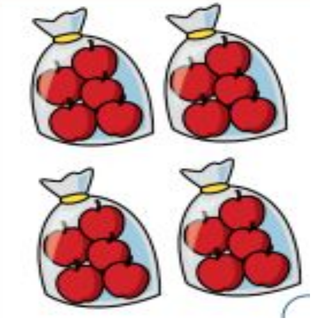
Children represent multiplication as repeated addition in many different ways.

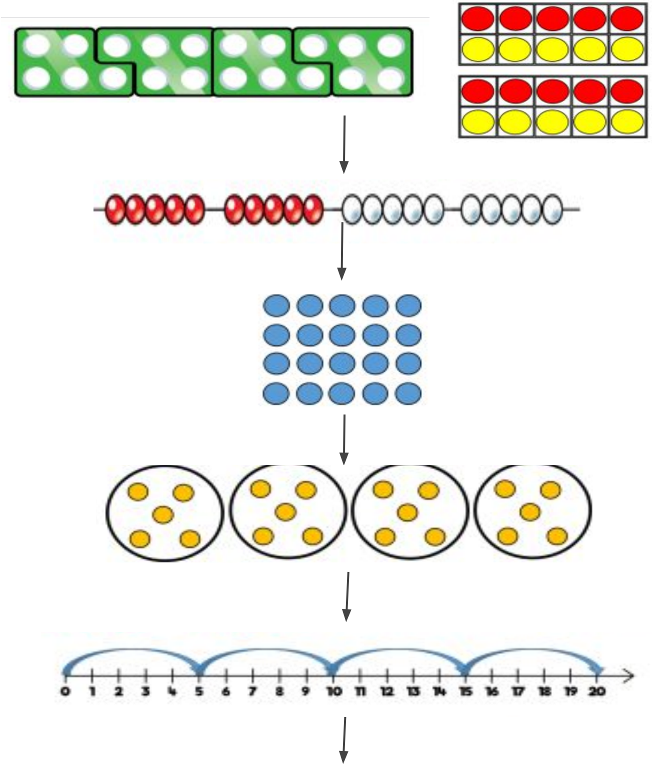
In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

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

<u>Calculation:</u>
One bag holds 5 apples, how many apples do four bags hold?







$5 + 5 + 5 + 5 = 20$

$4 \times 5 = 20$

$5 \times 4 = 20$

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

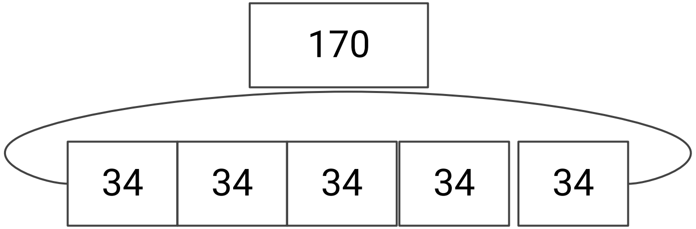
Representation

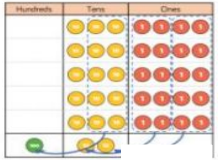
Methodology

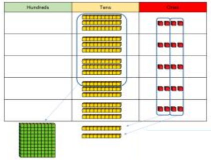
Year: 3/4

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.

<u>Calculation:</u>
34 x 5 = 170







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

	H	T	O
		3	4
×			5
	1	7	0
	1	2	

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

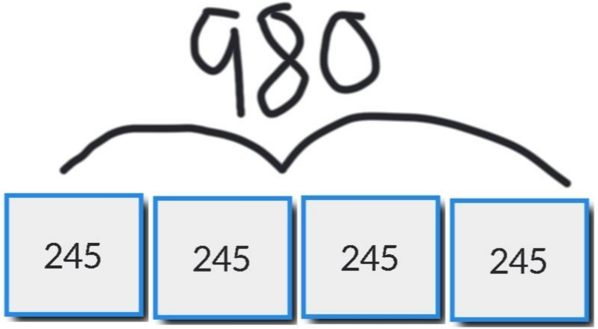
Representation

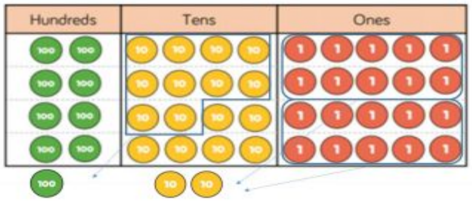
Methodology

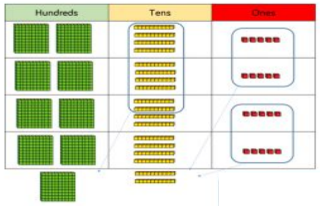
Year: 3/4

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.

<u>Calculation:</u>
245 x 4 = 980







	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

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

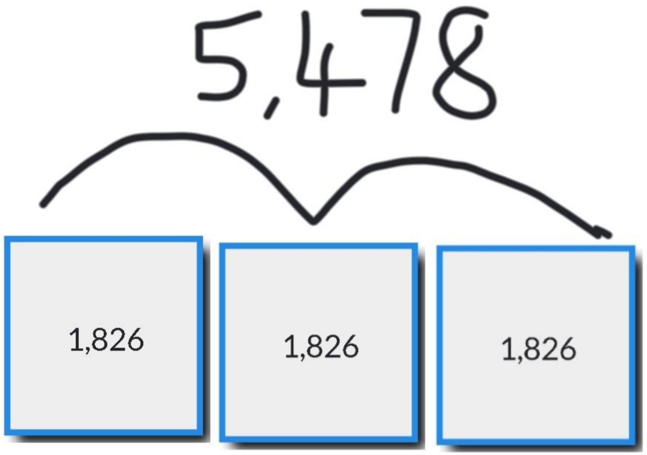
Representation

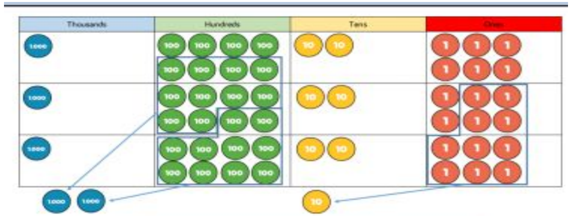
Methodology

Year: 5

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.

<u>Calculation:</u>
1,826 x 3 = 5,478





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

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

Year: 5

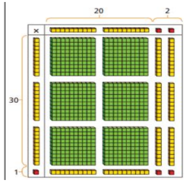
When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10. The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

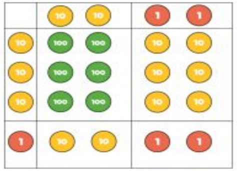
Representation

Calculation:
22 x 31 = 682

×	20	2
30	600	60
1	20	2

Methodology





×	20	2
30	600	60
1	20	2

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

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

Representation

Methodology

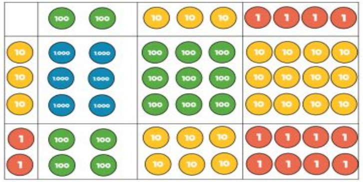
Year: 5

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.

Calculation:
234 x 32 = 7,488

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



↓

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

↓

Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$_1$7	$_1$0	2	0
7	4	8	8

Division

Skill	Year	Representations and models	
Solve one-step problems with division (sharing)	1/2	Bar model Real life objects	Arrays Counters
Solve one-step problems with division (grouping)	1/2	Real life objects Number shapes Bead strings Ten frames	Number lines Arrays Counters
Divide 2-digits by 1-digit (no exchange sharing)	3	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (sharing with exchange)	3	Straws Base 10 Bar model	Place value counters Part-whole model

Skill	Year	Representations and models	
Divide 2-digits by 1-digit (sharing with remainders)	3/4	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division
Divide 3-digits by 1-digit (sharing with exchange)	4	Base 10 Bar model	Place value counters Part-whole model
Divide 3-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division

Skill	Year	Representations and models	
Divide 4-digits by 1-digit (grouping)	5	Place value counters Counters	Place value grid Written short division
Divide multi-digits by 2-digits (short division)	6	Written short division	List of multiples
Divide multi-digits by 2-digits (long division)	6	Written long division	List of multiples

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

Representation

Methodology

Year: 1/2

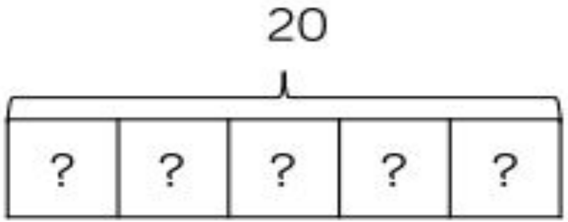
Children solve problems by sharing amounts into equal groups.

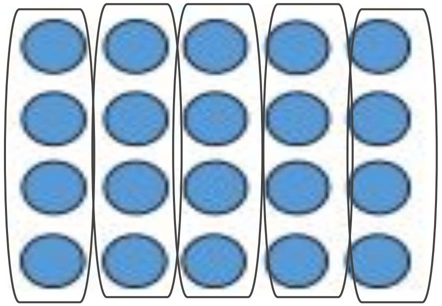
In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.

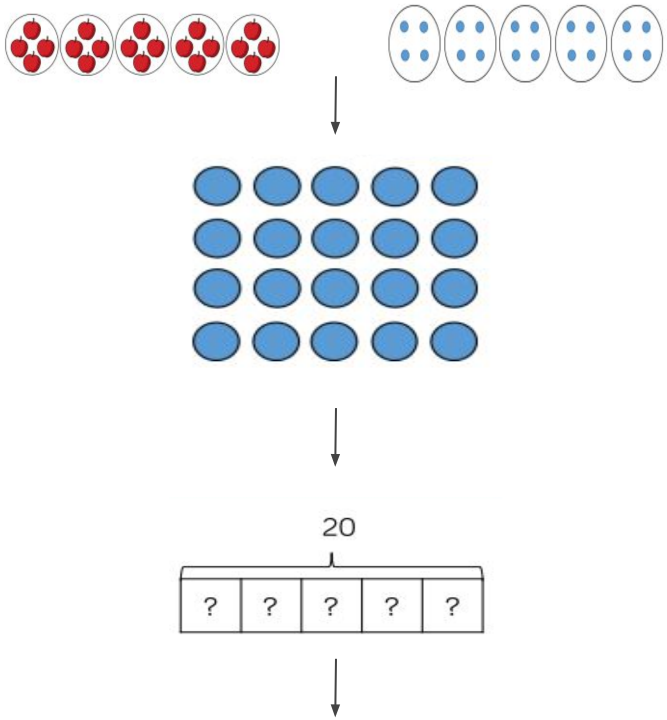
In Year 2, children are introduced to the division symbol.

<u>Calculation:</u>

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







$20 \div 5 = 4$

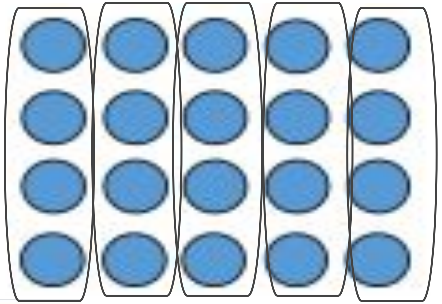
Skill: Solve 1-step problems using division (grouping)

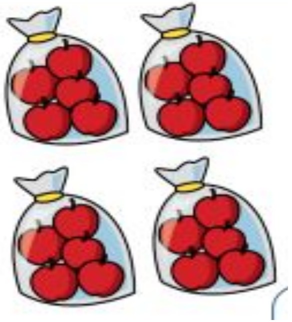
Year: 1/2

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.

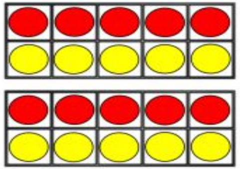
Representation

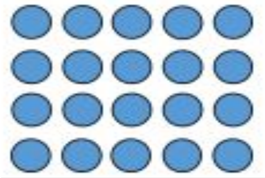
<u>Calculation:</u>
There are 20 apples altogether. They are put in bags 5 bags. How many bags are there?

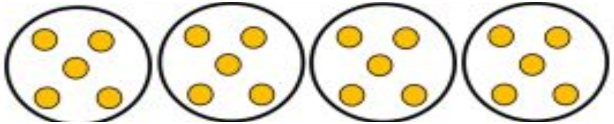




Methodology







$20 \div 5 = 4$

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

Representation

Methodology

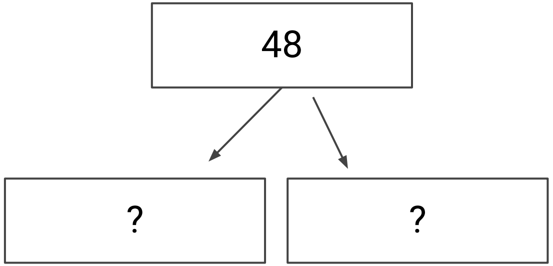
Year: 1/2

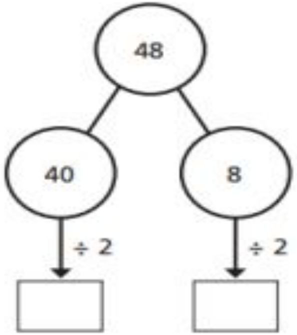
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

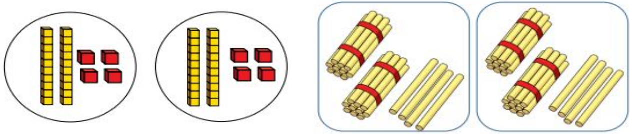
Straws, Base 10 and place value counters can all be used to share numbers into equal groups.

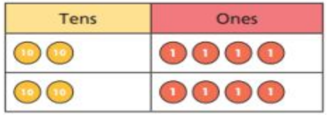
Part-whole models can provide children with a clear written method that matches the concrete representation.

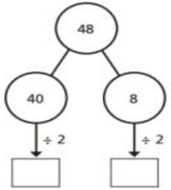
<u>Calculation:</u>
48 divided by 2 = 24











$48 \div 2 = 24$

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

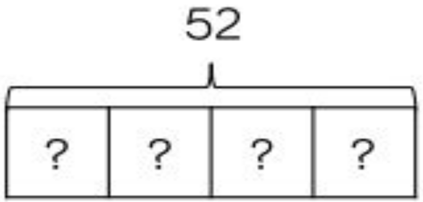
Year: 3/4

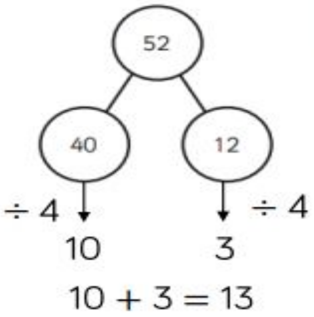
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

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

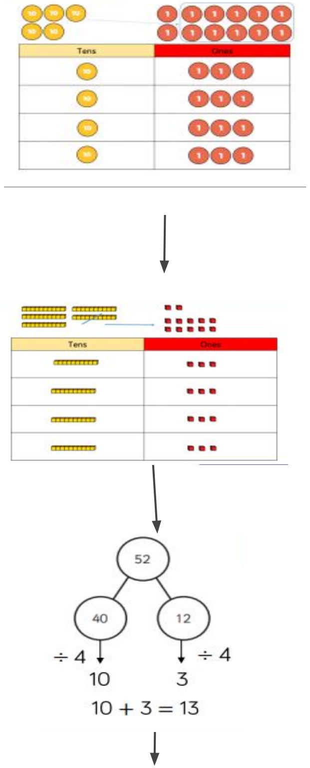
Representation

Calculation:
52 divided by 4 = 13





Methodology



$52 \div 4 = 13$

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

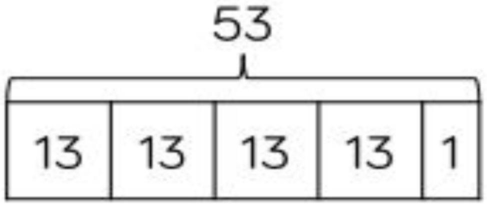
Representation

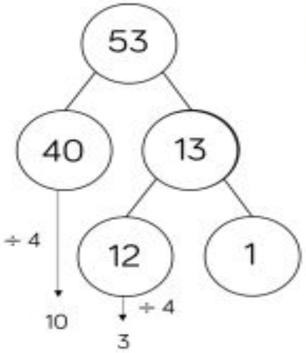
Methodology

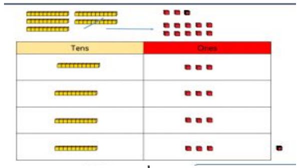
Year: 3/4

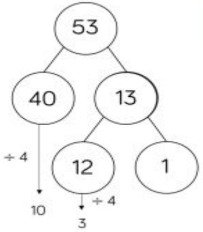
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.
Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.
Flexible partitioning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

<u>Calculation:</u>
53 divided by 4 = 13r1









$$53 \div 4 = 13 \text{ r}1$$

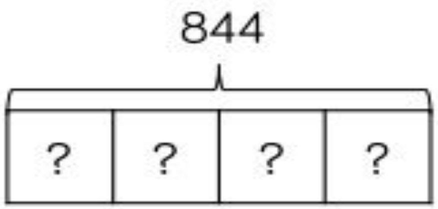
Skill: Divide 3-digits by 1-digit (sharing)

Year: 4

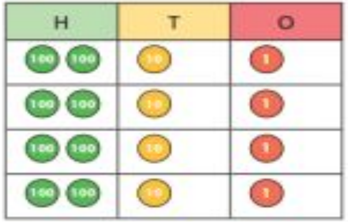
Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning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

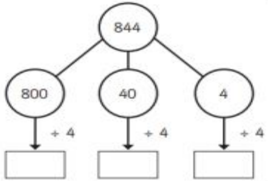
Representation

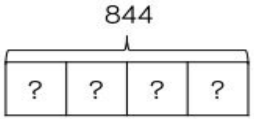
<u>Calculation:</u>
844 divided by 4 = 211



Methodology







$844 \div 4 =$ 211

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.

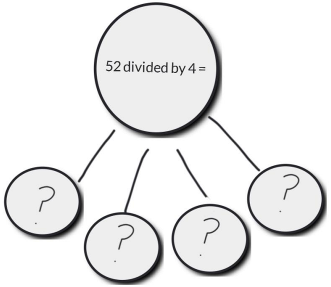
Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

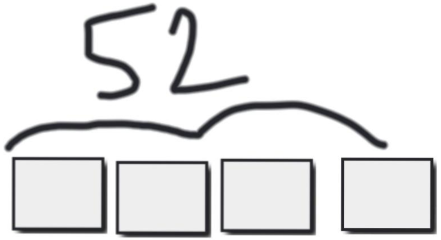
Remainders can also be seen as they are left ungrouped.

Representation

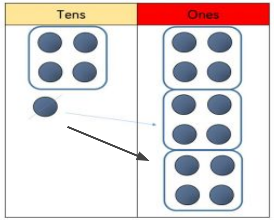
<u>Calculation:</u>

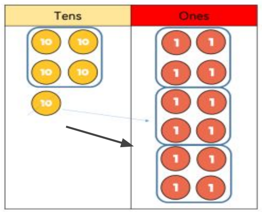
52 divided by 4 = 13





Methodology





$52 \div 4 = 13$

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

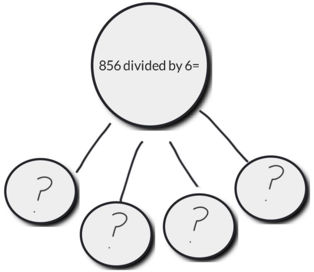
Year: 5

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

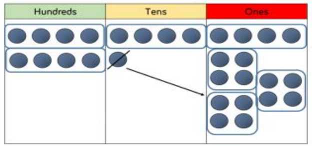
Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

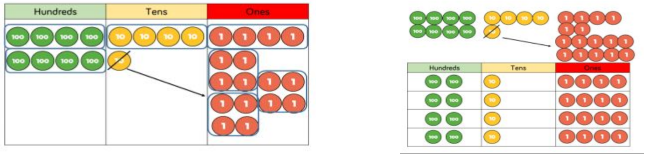
Representation

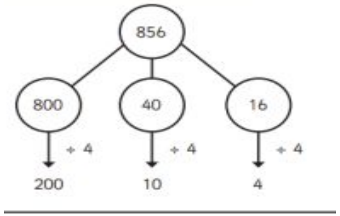
Calculation:
856 divided by 4 =



Methodology







		2	1	4
	4	8	5	16

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

Representation

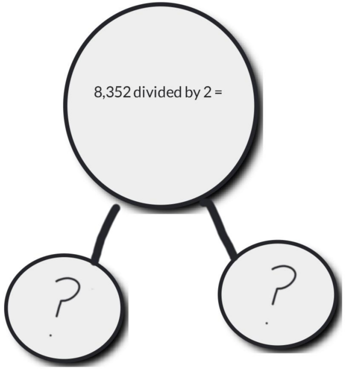
Methodology

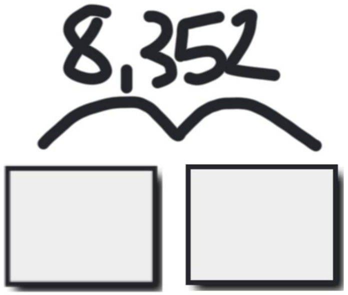
Year: 5

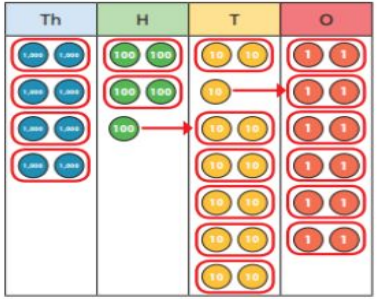
Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

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

<u>Calculation:</u>
8,352 divided by 2 = 4,266







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

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

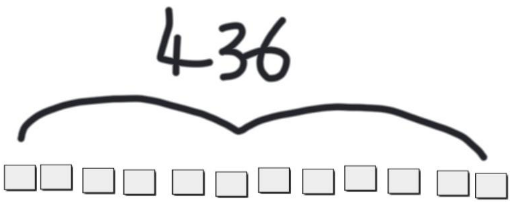
Representation

Methodology

Year: 6

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.

Calculation:
432 divided by 12 = 36



		0	3	6	
1	2	4	3	2	(×30)
	–	3	6	0	
			7	2	(×6)
	–		7	2	
				0	

12 × 1 = 12
12 × 2 = 24
12 × 3 = 36
12 × 4 = 48
12 × 5 = 60
12 × 6 = 72
12 × 7 = 84
12 × 8 = 96
12 × 7 = 108
12 × 10 = 120

$432 \div 12 = 36$

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

12 × Times Table

1 x 12 = 12
2 x 12 = 24
3 x 12 = 36
4 x 12 = 48
5 x 12 = 60
6 x 12 = 72
7 x 12 = 84
8 x 12 = 96
9 x 12 = 108
10 x 12 = 120
11 x 12 = 132
12 x 12 = 144

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

Representation

Methodology

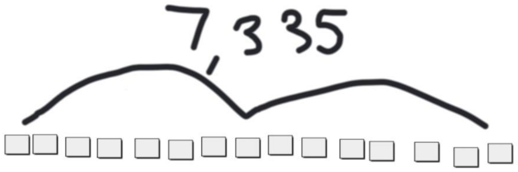
Year: 6

Children can also divide by 2-digit numbers using long division.

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.

Calculation:
7,335 divided by 15 = 489



15	30	45	60	75	90	105	120	135	150

↓

7,335 ÷ 15 = 489

	0	4	8	9	
15	7	3	3	5	
–	6	0	0	0	(×40C
	1	3	3	5	
–	1	2	0	0	(×80)
		1	3	5	
–		1	3	5	(×9)
				0	

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150

↓

	0	4	8	9
15	7	7 3	13 3	13 5

Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative – numbers can be added in any order.

Complement – in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference – the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange – Change a number or expression for another of an equal value.

Minuend – A quantity or number from which another is subtracted.

Partitioning – Splitting a number into its component parts.

Reduction – Subtraction as take away.

Subitise – Instantly recognise the number of objects in a small group without needing to count.

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total – The aggregate or the sum found by addition.

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor