



Calculation Policy

Hannah Perkins



Introduction

The following calculation policy has been devised 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 written calculations across the school. Prior Weston follows a concrete, pictorial and abstract approach. Use of manipulatives from EYFS right up to Year 6 will provide children with a consistent approach and also provides them with the building blocks for their learning. This approach enables children to visualise, explore and familiarise themselves with the structure of the maths being studied, leading to greater mathematical fluency and depth of understanding.

As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally. By the end of Year 6 children are equipped with a range of methods that they understand and can select from and use correctly. When faced with a calculation, children are able to decide which method is most appropriate and have strategies to check its accuracy. At whatever stage in their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.

The aims of the policy are that when children leave Prior Weston they:

- have a secure knowledge of number facts and a good understanding of the four operations;
- are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies to special cases involving bigger numbers;
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads;
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally;

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Key Vocabulary

Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, exchange, regroup, carry, expanded, compact, thousands, hundreds, digits, inverse, fact family, decimal places, decimal point, tenths, hundredths, thousandths

Subtraction

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, units, exchange, regroup decrease, hundreds, value, digit, inverse, fact family, expanded, compact, tenths, hundredths, decimal point, decimal

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value, inverse, fact family, prime, prime factor, composite, square, factor, integer, decimal, short/long multiplication, carry, tenths, hundredths, decimal

Division

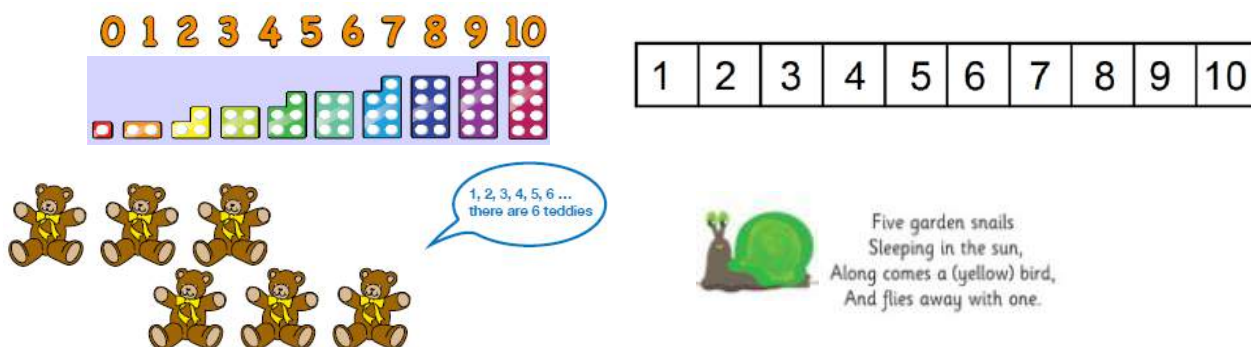
share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, line, left, left over, inverse, fact family, chunking, carry, exchange, regroup, remainder, multiple, divisible by, factor, short division, quotient, prime number, prime factors, composite number (non-prime), common factor



Addition

EYFS

Children need to be able to count reliably with numbers from 1 to 20 and place them in order. Counting songs and rhymes, as well as practical activities, should be used to introduce and embed concept of number.



Children should have an understanding of what “more” means and be able to find and say what is one more than a given number.



Children should begin to relate addition to combining groups of objects and then counting the result. Construct number sentences verbally, or by using cards to go with practical activities and encourage children to read number sentences aloud in different ways e.g. “three add two equals 5” or “four plus 3 makes 7”. Children make a record of addition activities already carried out in pictures, words, numicon or symbols.



Key Vocabulary: Games and songs can be a useful way to begin using the vocabulary involved in addition. add, more, plus, makes, total, altogether, score, double, one more, two more, ten more how many more to make...? how many more is ... than ...?

Key skills for addition in Foundation Stage:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Use the language of ‘more’ and ‘fewer’ to compare two sets of objects.
- Find the total number of items in two groups by counting all of them.
- Say the number that is one more than a given number.
- Find one more from a group of up to five objects, then ten objects.
- In practical activities and discussion, begin to use the vocabulary involved in addition
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations



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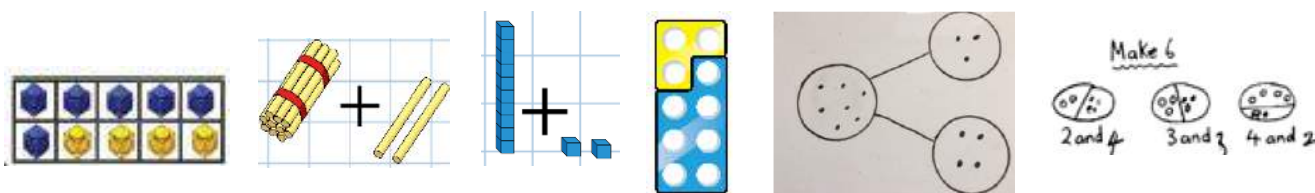
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Year 1

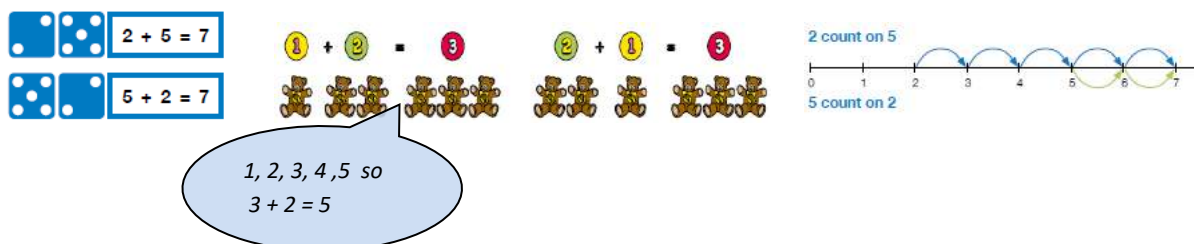
Concrete and Pictorial

Children should have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.

Children need to use number bonds and related facts within 10 and 20 and represent them in a variety of ways. They should be encouraged to explore number bonds systematically. They are taught to partition and combine tens and ones using a range of concrete resources and become fluent in describing the parts and whole of an amount.



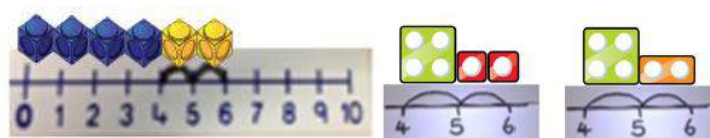
Commutative law is introduced in simple terms and children begin to discover that addition can be done in any order. This will lead to a progression in understanding that it is more efficient to add starting with the biggest number.



Children learn to add and subtract one-digit and two-digit numbers to 20, including zero. They know to count forwards and to start with the biggest number and add the smaller number on. Ten frames and bead strings in particular should be used to illustrate bridging e.g. by counting on 2 then counting on 3.



Number lines can begin to be modelled using cubes or Numicon.





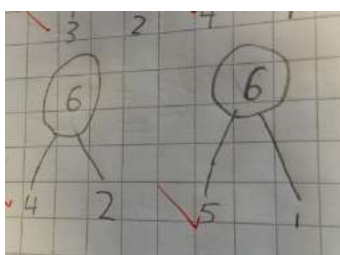
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Abstract

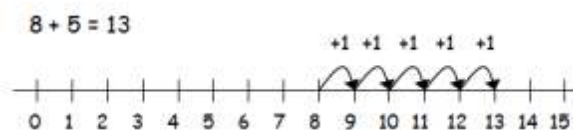
Through the wide use of different manipulatives and representations, children should now have developed a good structural understanding of number bonds and addition. Where possible the teaching of abstract methods should be introduced alongside a familiar pictorial representation to emphasise the link between the two. Maths, for young children in particular, should be meaningful and so concepts should regularly be taught in the context of real life – addition stories are particularly useful for this using a 'first, next, now model' e.g. First, there were 4 birds in a tree. Next, 2 more birds flew to the tree and joined them. Now there are ____ birds.

Children build on their use of part-whole models to record number bonds, addition facts and fact families. They can talk fluently about the parts and whole of a number. Within fact families, children can describe what is similar or different about the number sentences.



5 is a part. 1 is a part. The whole is 6.

Children use numbered number lines to add, by counting on in ones. They are encouraged to start with the **larger** number and count on.



Children should become confident with a number line question being verbally expressed in a variety of ways.



E.g. What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2?

Children are introduced to the + and = symbols and use these to record the appropriate number sentence for a concrete/pictorial representation or to record a mental calculation. Children should develop an understanding of equality and the = sign. Emphasise to children that it does not always have to come towards the end of a number sentence. Children can use this understanding of = to approach simple missing number problems.

Show that 3 green cubes plus 4 red cubes is equal to 7 cubes.



Write this as a number sentence.

$$\square + \square = \square$$

$$1 + 2 = 3$$

$$3 = 2 + 1$$

$$2 + 1 = 0 + 3$$

$$6 + \square = 11$$



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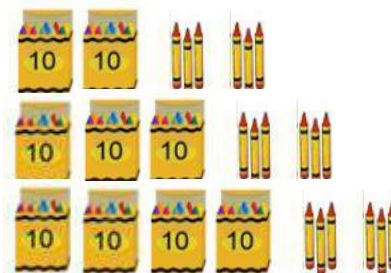
Year 2

Concrete and Pictorial

Children should have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.

Children use manipulatives to develop a secure understanding of place value within a two-digit number. They use this knowledge to help find 1/10 more or less than a given number.

10 less		10 more
2	12	22
	37	

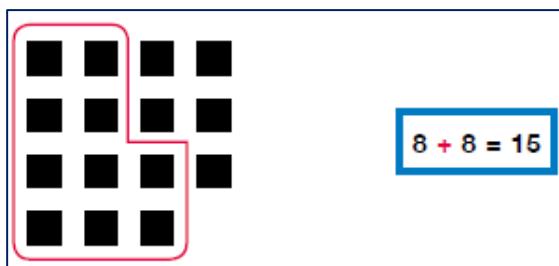


They understand that a number can be partitioned in multiple ways and begin to apply this to addition calculations e.g. to help them bridge through ten. Children have a secure knowledge of number bonds to 10 and 20 and use this to support their calculations. They should be encouraged to make links between single digit bonds and tens bonds.

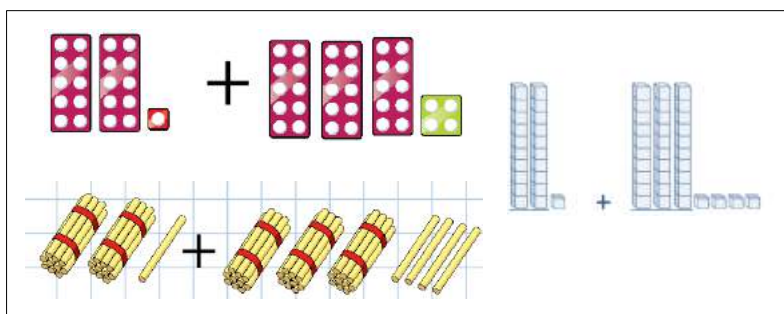
25

25 can be made from:

- 25 ones
- 20 + 5
- 15 and 10
- $25 = 11 + 14$



Children can add the tens and the ones separately and combine their answers, making exchanges where necessary.





Abstract

Children use their knowledge of partitioning to add together two 2-digit numbers using the 'W method'. First, adding the tens, followed by the ones and finally combining the two answers. This draws upon children's mental addition skills and requires them to add holding the larger number in their head and counting on. (An intermediary step can be recording the partitioned number sentences in full).

W method

$$\begin{array}{r} 37 \\ 30 \quad 7 \end{array} + \begin{array}{r} 55 \\ 50 \quad 5 \end{array} =$$

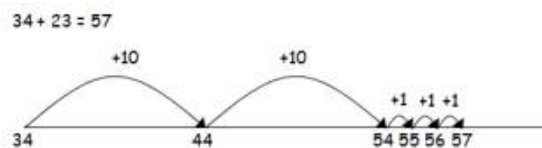
$$30 + 50 = 80$$

$$7 + 5 = 12$$

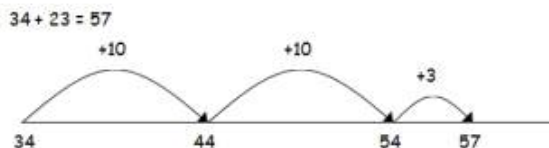
$$80 + 12 = 92$$

Children develop their mental fluency with addition and place value involving 2-digit numbers, then establish more formal methods as appropriate. Children will progress from numbered number lines to using 'empty' number lines, starting with the larger number and counting on.

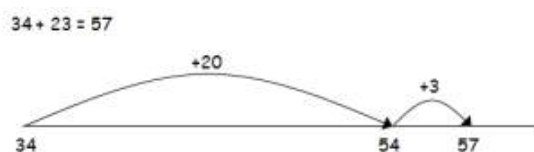
First, counting on in tens and ones:



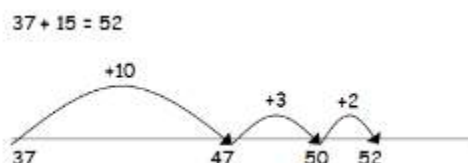
Then becoming more efficient by adding the units in one jump (e.g. using the known fact $4 + 3 = 7$):



Followed by adding the tens in one jump:



Bridging through ten can help children become more efficient:



Number tracks can be used to represent counting in 1s, 2s, 5s and 10s. Teachers should draw attention to how the ones/tens digit changes or remains the same and children should be encouraged to look for patterns and rules.

10	20	30			
----	----	----	--	--	--

			35	45	55			
--	--	--	----	----	----	--	--	--

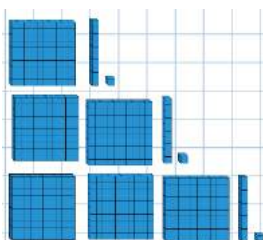


Year 3

Concrete and Pictorial

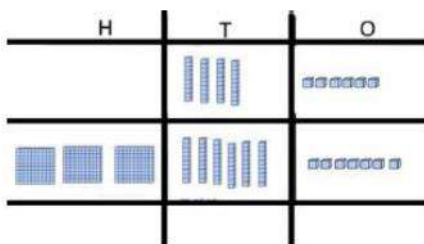
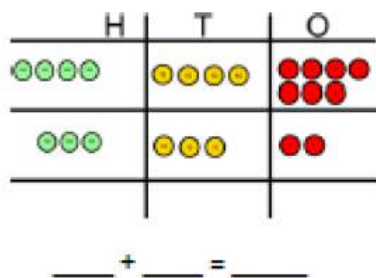
Children should have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.

Children will use dienes and place value counters to practise adding 1s, 10s and 100s to a 3-digit number.



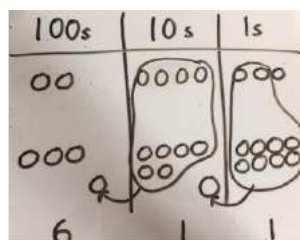
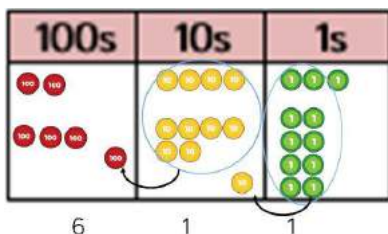
100 less	Number	100 more

Children add together numbers up to three digits using dienes and counters. Manipulatives are laid out in place value grids in preparation for the abstract move later on to the column addition method. Children are also encouraged to use the manipulatives to explore inverse and the relationship between + and -.

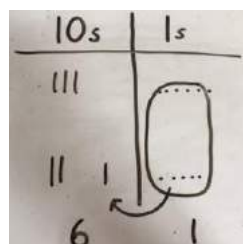
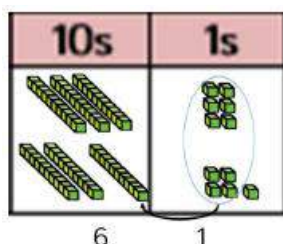


Children use manipulatives to practise making single (and multiple) exchanges and are also able to record these pictorially.

243 + 368



36 + 25





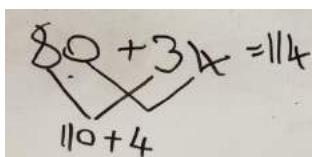
Abstract

Number tracks can be used to show the addition of 1s, 10s and 100s or counting in 3s, 4s and 8s. Teachers should draw attention to how the ones/tens/hundred digit changes or remains the same and children should be encouraged to look for patterns and rules.

120	220	320	420	520
-----	-----	-----	-----	-----

Children continue to draw upon their knowledge of partitioning and the 'W Method' to add together two 2-digit numbers.

W method

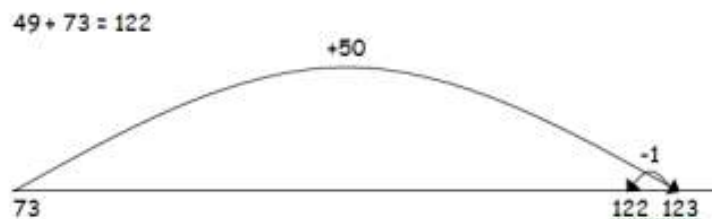


Children will continue to use empty number lines with increasingly large numbers, including drawing upon mental strategies such as compensation where appropriate.

They count forwards from the largest number irrespective of the order of the calculation:

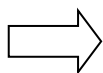


They use compensation:



They will begin to use more formal written methods starting with expanded column addition, adding the least significant digits first in preparation for progression to the compact version of the column method. It is important that children draw upon their place value knowledge and work with manipulatives to understand and articulate what exchanges they are making and why.

2	0	0	+	6	0	+	4
1	0	0	+	2	0	+	6
3	0	0	+	8	0	+	10



2	6	4
1	2	6
3	9	0



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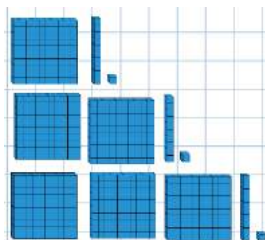
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Year 4

Concrete and Pictorial

Children should have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.

Children will use dienes and place value counters to practise adding 1s, 10s, 100s and 1000s to a 3- or 4-digit number.



1000 less	Number	1000 more

Children add together numbers up to four-digits using dienes and counters. Manipulatives are laid out in place value grids in preparation for the abstract move later on to the column addition method. Children are also encouraged to use the manipulatives to explore inverse and the relationship between + and -.

1,000s	100s	10s	1s

H	T	O

Children use manipulatives to practise making single (and multiple) exchanges and are also able to record these pictorially. They will explore exchanges as they occur in different place value columns and look for similarities/differences.

$$243 + 368$$

100s	10s	1s
6	1	1

100s	10s	1s
6	1	1

$$1153 + 4329$$

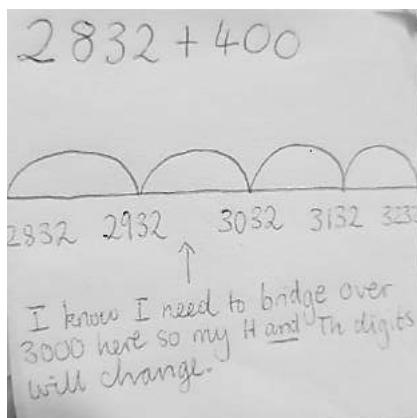
Thousands	Hundreds	Tens	Ones
5	4	8	2

Th	H	T	O
5	4	8	2



Abstract

Children can use empty number lines to record adding multiples of 1, 10, 100 or 1000. Discuss the rules discovered together earlier on which digits will or won't change. Children should think ahead and try to anticipate the 'tricky part' where more than one digit will change as they bridge over a particular number.



Children will move from expanded addition to the compact column method, adding least significant digits first, and carrying digits underneath the calculation.

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



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

Using similar methods, children will:

- Add together mismatched numbers i.e. numbers with different numbers of digits
- Add together several numbers
- Begin to add two or more 3-digit sums of money, with or without adjustment from the pence to the pounds
- Know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p

	3	5	1	7
+		3	9	6
	3	9	1	3



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Year 5

Concrete and Pictorial

Manipulatives and pictorial representations are still an important part of building children's understanding of mathematical concepts, even in the older years. They may not need to be used as frequently but they should be used as an initial gateway into a method or strategy. Children who are less secure in maths, in particular with place value, may benefit from more use of manipulatives. See the pages for younger year groups for ideas.

Children add together numbers up to five-digits using dienes and counters. Manipulatives are laid out in place value grids and completed alongside written column addition method. Children are also encouraged to use the manipulatives to explore inverse and the relationship between + and -.

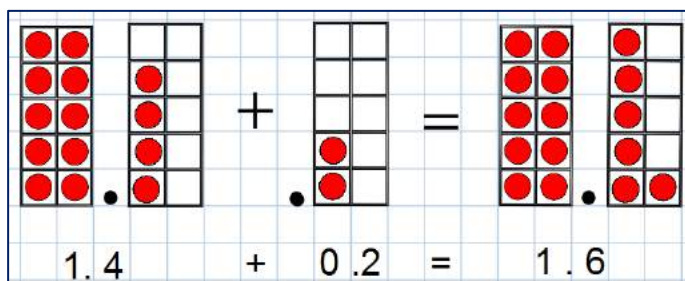
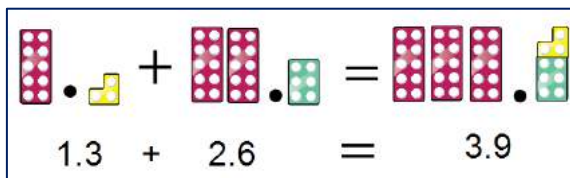
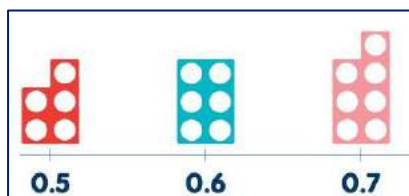
Place Value Grid					Calculation
TTh	Th	H	T	O	
1000	100	100	10	1	2 6 2 3 6
1000	100	100	10	1	+ 1 5 1 2 8
1000	100	100	10	1	4 1 3 6 4
1000	100	100	10	1	1 1

Place value counters should also be used to support addition of numbers with decimals.

O	.	Tth	Hth	Thth
1		0.1	0.01	0.001
1		0.1	0.01	0.001
1		0.1	0.01	0.001
1		0.1	0.01	0.001

2.413
+ 1.211
3.624

Children should also use Numicon and ten frames to consolidate this addition of decimals.





Abstract

Children should extend the compact column method to numbers with more than four digits.

$$\begin{array}{r} 23481 \\ + 1362 \\ \hline 24843 \end{array}$$

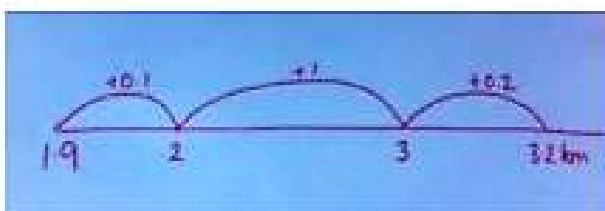
Using similar methods, children will:

- Add several numbers with different numbers of digits
- Begin to add two or more decimal fractions with up to three digits and the same number of decimal places
- Know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. $3.2\text{m} - 280\text{cm}$

$$\begin{array}{r} \text{£} 23.59 \\ + \text{£} 7.55 \\ \hline \text{£} 31.14 \end{array}$$

$$\begin{array}{r} 19.01 \\ 3.65 \\ + 0.70 \\ \hline 23.36 \end{array}$$

Children may use jottings such as partitioning and recombining or number lines to alongside their written methods where needed.



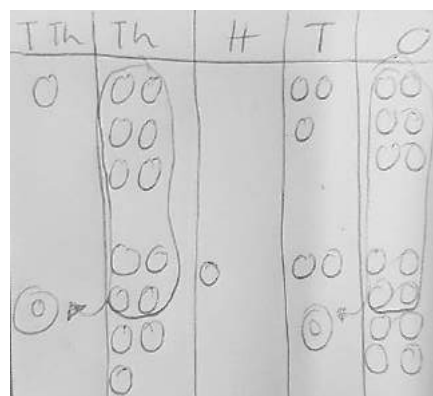
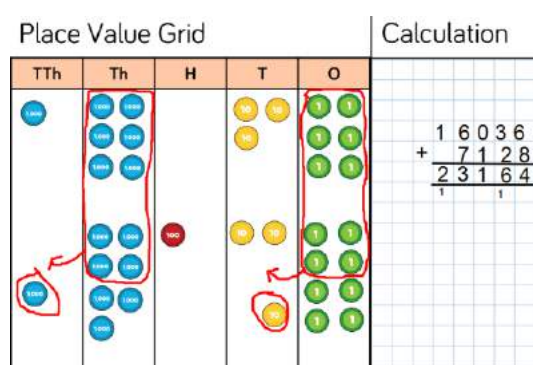
$$\begin{aligned} &12\,462 + 2300 \\ &= 12\,462 + 2000 + 300 \\ &= 14\,462 + 300 \\ &= 14\,762 \end{aligned}$$

Year 6

Concrete and Pictorial

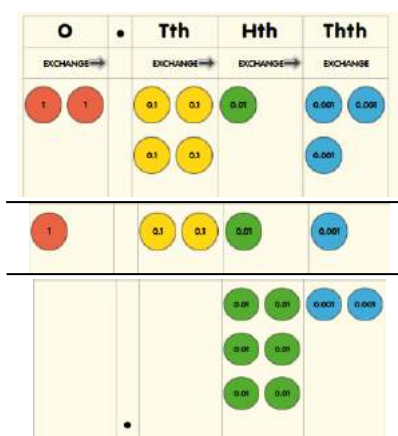
Manipulatives and pictorial representations are still an important part of building children's understanding of mathematical concepts, even in the older years. They may not need to be used as frequently but they should be used as an initial gateway into a method or strategy. Children who are less secure in maths, in particular with place value, may benefit from more use of manipulatives. See the pages for younger year groups for ideas.

Children add together numbers up to seven-digits using dienes and counters. Manipulatives are laid out in place value grids and completed alongside written column addition method. Children are also encouraged to use the manipulatives to explore inverse and the relationship between + and -.



Place value counters should also be used to support addition of numbers with decimals.

$$\begin{array}{r} 2.413 \\ +1.211 \\ \hline 0.062 \\ 3.686 \end{array}$$





Abstract

Children should extend the compact method to numbers of increasing complexity.

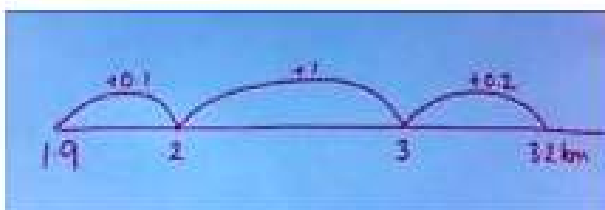
	8	1	0	5	9
		3	6	6	8
		1	5	3	0
					1
+	2	0	5	5	1
1	2	0	5	7	9
	1	1	1	1	

Using similar methods, children will:

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

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

Children may use jottings such as partitioning and recombining or number lines to alongside their written methods where needed.



$$\begin{aligned}
 &12\,462 + 2300 \\
 &= 12\,462 + 2000 + 300 \\
 &= 14\,462 + 300 \\
 &= 14\,762
 \end{aligned}$$



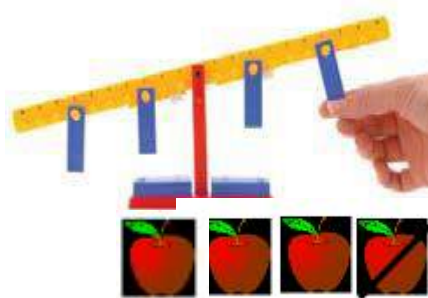
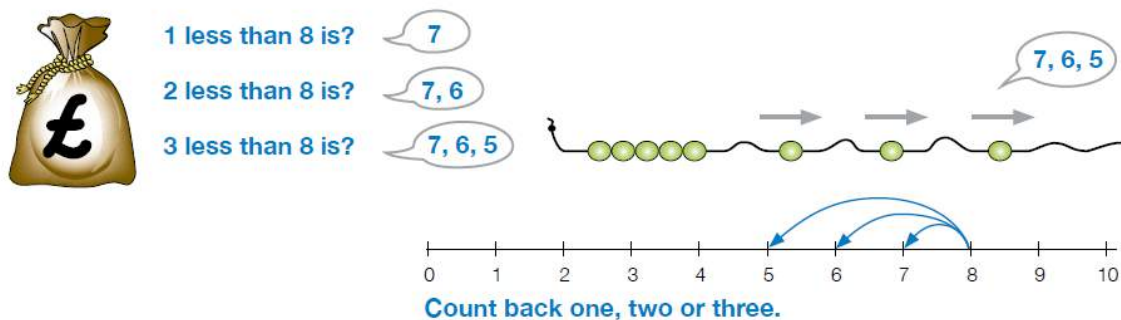
Subtraction

EYFS

Using a range of practical resources and real life contexts, pupils develop their understanding of the concept of subtraction through counting activities. They then use pictures/diagrams to represent the calculation.

Key concepts in EYFS:

- Ensure that '**difference**' is used by adults when discussing numbers with children to show that numbers are unequal; promote use by the children with sentence stems, including comparatives ("This number is **larger than/smaller than**...").
- Begin to 'take away' objects to see how many are left/remain ("I **take away** 2 and there are **4 left**.")
- Practise **counting back** from any given number.
- Find **one less than** a number up to 10.



Key Vocabulary: Games and songs can be a useful way to begin using the vocabulary involved in subtraction: e.g. Five Little Men in a Flying Saucer, Ten Green Bottles, Five Currant Buns
take, take away, leave, subtract, minus, equals, number sentence, count back, one less, two less, ten less how many are left / left over? how many have gone? how many fewer is ... than ...?

Key skills for subtraction in Foundation Stage:

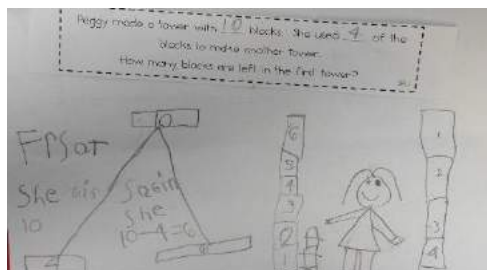
- Select the correct numeral to represent 1 to 5, then 1 to 10 objects. (1-20 when confident)
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Use the language of 'more' and 'fewer' to compare two sets of objects.
- Say the number that is one less than a given number.
- Find one less from a group of up to five objects, then ten objects.
- In practical activities and discussion, begin to use the vocabulary involved in subtraction
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations



Year 1

Concrete and Pictorial

Concrete resources are fundamental for illustrating the concept of subtraction as both **taking away** and **finding the difference**. Model and encourage the use of sentence stems.



Children are encouraged to develop a **mental picture** of the number system in their heads to use for calculation. Different means of representation and recording (e.g. drawing) will be used by the children to support them in learning how to do this.

Illustrated story frames alongside sentence stems also enable children to build a mental picture.

There were 16 biscuits on a plate and Finn ate 5 of them.

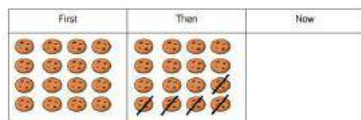
Complete the sentences.

First there were ___ biscuits.

Then ___ were eaten.

Now there are ___ biscuits.

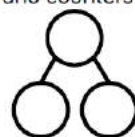
$16 - 5 = \underline{\quad}$



First there were 18 sheep. Four of them ran away.

How many sheep are left?

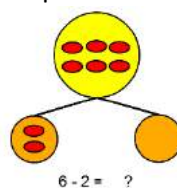
Use ten frames and counters to represent the sheep.



$\square - \square = \square$

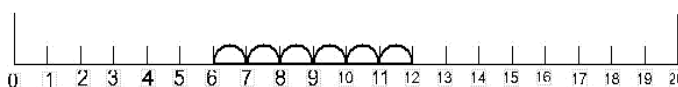
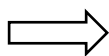
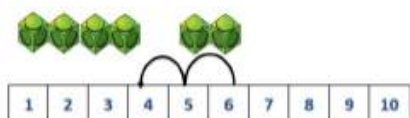
Use the part-whole model alongside manipulatives to promote fluency in recognition of number and link to subtraction. Aim to ensure that number patterns to promote counting fluency are used in representations:

$7 - 4 = 3$

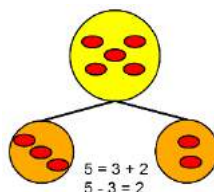
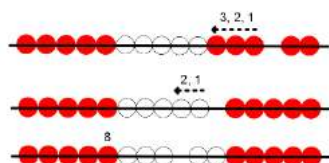


Initially use a number track to count back for subtraction in order to support future transition to a marked number line:

$6 - 2 = 4$

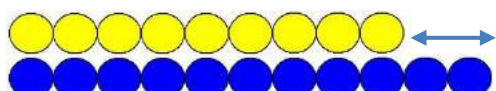


Bead strings or bead bars can be used to illustrate subtraction including bridging through ten, supported by application of the part-whole model as above:



Counters, counting objects and pictures are useful for illustrating subtracting as **finding the difference**:

$11 - 9 = 2$ "The difference between nine and eleven is two."



How many less is 3 than 6?





Prior Weston Primary School and Children's Centre Calculation Policy

January 2019

Abstract

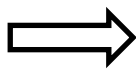
With the initial support of a real-life context, children move to record their understanding of subtraction by writing number sentences and the symbol of $-$ is introduced. Subtraction stories are particularly useful for this using a 'first, next, now model' e.g. *First, there were 6 birds in a tree. Next, 2 birds flew away from the tree. Now there are ___ birds left.* Where possible, repeatedly link the abstract number sentence to the concrete and pictorial representations they have been working on.

Think of two questions to ask your friend about the image.



Represent them about the calculation.

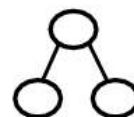
$$\square - \square = \square$$



There are 9 party hats altogether. 4 of them are red. The rest are blue. How many are blue?

$$9 - \square = \square$$

There are ___ blue party hats.

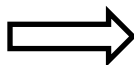


Develop children's understanding of the inverse relationship between subtraction and addition and the laws of commutativity. This should be initially modelled in the concrete pictorial stage and then, when children's understanding is secure, they can be encouraged to find fact families for a set of a numbers or a word problem. Stress the idea that the equals sign can be positioned at the start or end of a calculation. It is important that children are exposed to the use of zero.

Using the image, how many calculations can you create?



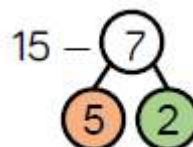
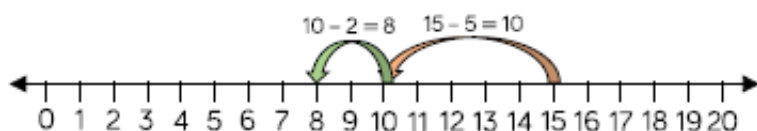
$$\begin{array}{l} \square + \square = \\ \square + \square = \\ \square - \square = \\ \square - \square = \end{array} \quad \begin{array}{l} \square = \square - \square \\ \square = \square - \square \\ \square = \square + \square \\ \square = \square + \square \end{array}$$



There are 10 ducks in a pond. 10 of them fly away.

Complete 8 number sentences.

For the first time children will undertake subtraction where they have to cross 10. They will build on their previous knowledge of partitioning numbers, different ways of making numbers within 10, as well as counting back and 'crossing out' methods of subtraction. Use part whole models to demonstrate the link between partitioning and bridging. This can be demonstrated alongside a number line to support





Prior Weston Primary School and Children's Centre Calculation Policy

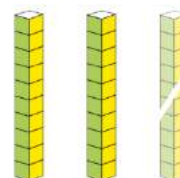
January 2019

Year 2

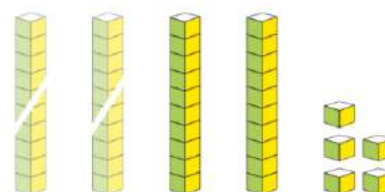
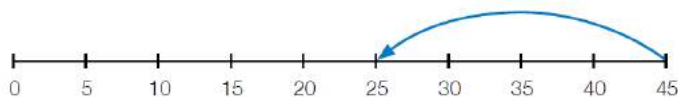
Concrete and Pictorial

Dienes, bead strings and other objects can be used to continue to demonstrate the concept of 'taking away' and 'finding the difference', with language carefully selected and modelled and sentence stems provided. Children can then move to their own drawn versions, supported by resources to aid understanding (e.g. 100 square).

Dienes can support understanding of taking away 10 from a multiple of 10, with a link made to the relevant number line:

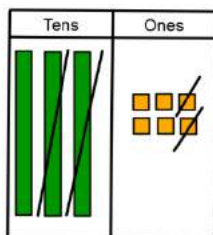


Taking away 10 from any 2-digit number can be supported in the same way:



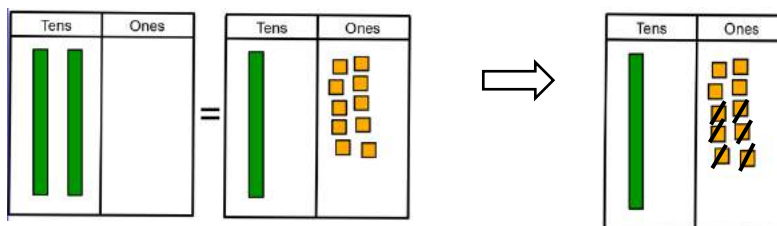
Subtracting without regrouping can be demonstrated using Dienes and a place value chart to begin partitioning numbers.

E.g. $36 - 22 = 14$

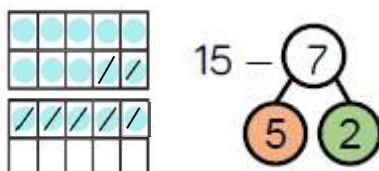


Begin to demonstrate regrouping by exchanging Dienes and completing the calculation.

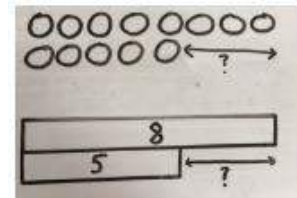
E.g. $20 - 6 = 14$



Use ten frames alongside part whole models to support children with their bridging through ten.



Use a range of manipulatives, including Numicon, Cuisenaire rods and cubes, to support children in finding the difference. Children can then draw the objects that they have used or use bar modelling to illustrate what they need to calculate.





Abstract

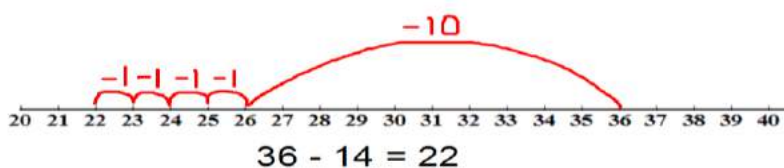
Children begin to solve 2-digit subtract 1-digit questions by partitioning the latter number to make ten:

$$\begin{array}{r} 14 - 5 = 9 \\ \swarrow \searrow \\ 4 \quad 1 \\ 14 - 4 = 10 \\ 10 - 1 = 9 \end{array}$$

Children build on this and apply their understanding that one ten is the same as ten ones to make an exchange when crossing a ten in subtraction. This method builds on their understanding of part whole models and can be initially modelled alongside to dienes to demonstrate the different ways of partitioning. (Building confidence in the column method in later years).

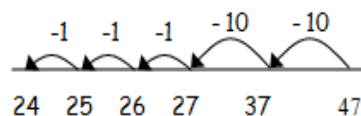
$$\begin{array}{r} 42 - 15 = \\ \swarrow \searrow \\ 40 \quad 2 \\ -10 \quad -5 \end{array} \quad \begin{array}{l} \text{We can't} \\ \text{subtract the} \\ \text{ones. Can we} \\ \text{partition} \\ \text{differently?} \end{array} \quad \begin{array}{r} 42 \\ \swarrow \searrow \\ 30 \quad 12 \\ -10 \quad -5 \\ \hline 20 \quad 7 \end{array} \quad \begin{array}{l} \text{Now we can subtract} \\ \text{the ones and then} \\ \text{subtract the tens.} \\ 42 - 15 = 27 \end{array}$$

Children start by showing their subtraction on a **numbered** number line, **counting backwards** in 10s and 1s:

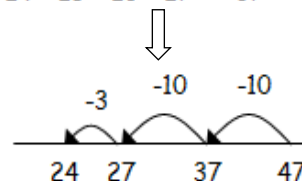


Children should then move to an **'empty'** number line, relating the number line to the number sentence:

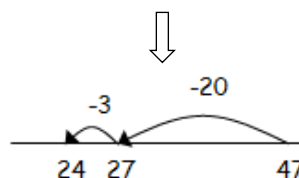
First counting back in tens and ones: $47 - 23 = 24$



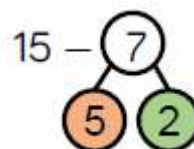
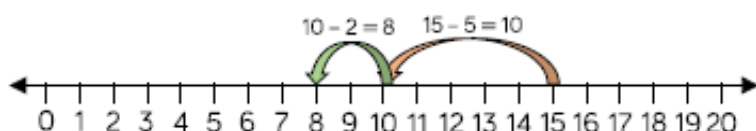
Then becoming more efficient by subtracting the units in one jump (using the known fact $7 - 3 = 4$):



Followed by subtracting the tens in one jump and the units in one jump:



Bridging through ten can help children become more efficient - a part-whole model alongside a number line will aid children's understanding of this. Start this process on a numbered number line using small 2-digit subtract 1-digit questions. When children are confident on the process they can move onto 2-digit subtract 2-digit questions.





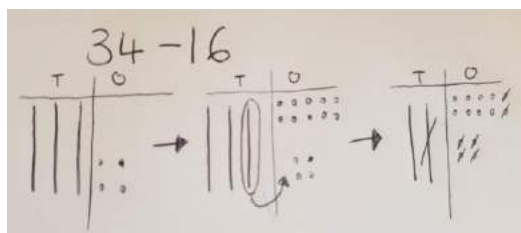
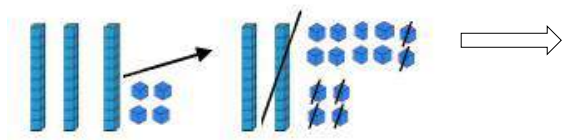
Year 3

Concrete and Pictorial

Continue to use Dienes and other resources to demonstrate subtraction, **particularly the exchange of 1 ten for 10 ones**. This is essential at this stage so that children have a good, in-depth understanding of the process of regrouping for more formal written methods.

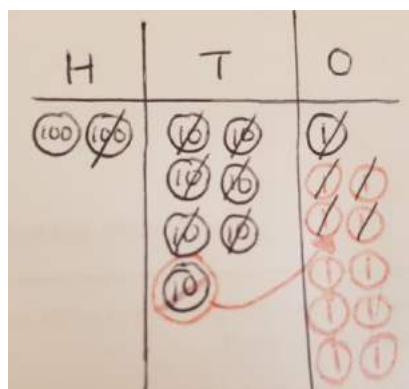
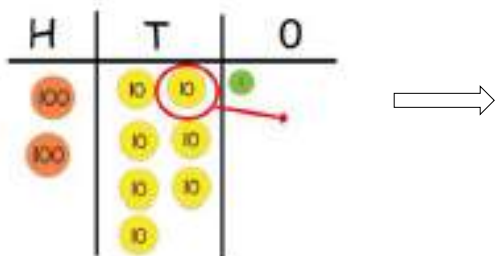
Below is an example of how Dienes could be used to support learners to understand a 2-digit minus 2-digit calculation involving regrouping ($34 - 16$):

Take 16 away from 34

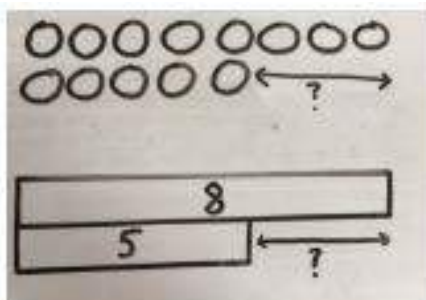


Place value counters should also be used to demonstrate regrouping.

$271 - 165$



Continue to use manipulatives such as Numicon, Cuisenaire rods and cubes, to find the difference. Children can then draw the objects they have used or use bar modelling to illustrate what they need to calculate. Numicon can be used for 2-digit numbers in the same way as shown below:





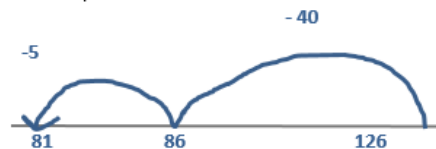
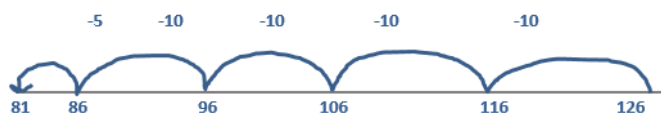
Prior Weston Primary School and Children's Centre Calculation Policy

January 2019

Abstract

Initially, children will continue to use an 'empty' number line (see year 2). Further develop its use with calculations that bridge 100, using resources such as a 200 grid to support counting back in 10s and bridging 100. When children are confident, the use of more efficient jumps should be promoted:

$$126 - 45 = 81$$



Introduce children to the column method through the use of the expanded written method. Use two-digit numbers when introducing this method and move onto three-digits when children are secure.

$$78 + 23 = 55$$

$$\begin{array}{r} 70 \text{ and } 8 \\ -20 \text{ and } 3 \\ \hline 50 \text{ and } 5 = 55 \end{array}$$



500	40	9
300	30	8

Step 1:
Partition the numbers and write them out in expanded form.

500	40	9
300	30	8
200	10	1

Step 2:
Subtract the digits, starting with the ones column

$$200 + 10 + 1 = 211$$

Step 3:
Combine the totals together to find the final answer.

For questions where regrouping is required draw on children's partitioning knowledge and encourage them to find an alternative way of partitioning the number. Use Numicon or dienes to support:

Step 1

$$\begin{array}{r} 70 \text{ and } 1 \\ -40 \text{ and } 6 \\ \hline \end{array}$$

Step 2

$$\begin{array}{r} 60 \text{ and } 11 \\ -40 \text{ and } 6 \\ \hline 20 \text{ and } 5 = 25 \end{array}$$

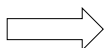
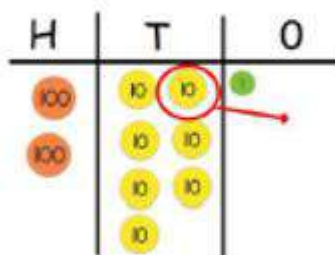
The calculation should be read as e.g. take 6 from 1.

This would be recorded by the children as:

$$\begin{array}{r} 60 \\ \cancel{70} \text{ and } 11 \\ -40 \text{ and } 6 \\ \hline 20 \text{ and } 5 = 25 \end{array}$$

When confident in applying this strategy children can be moved from the expanded column method to the compact version. Discuss why this is more efficient and introduce the written method alongside manipulatives.

$$271 - 165$$



		6	
	2	7	1
-	1	6	5
	1	0	6



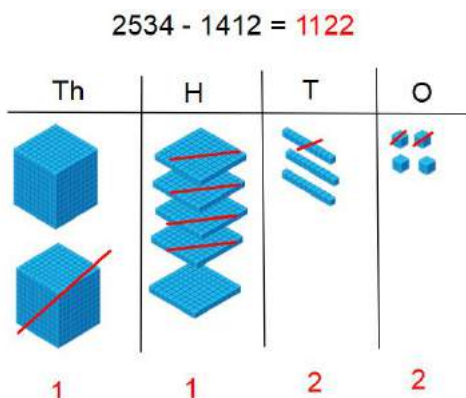
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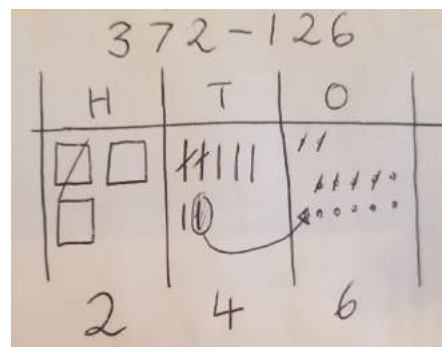
Year 4

Concrete and Pictorial

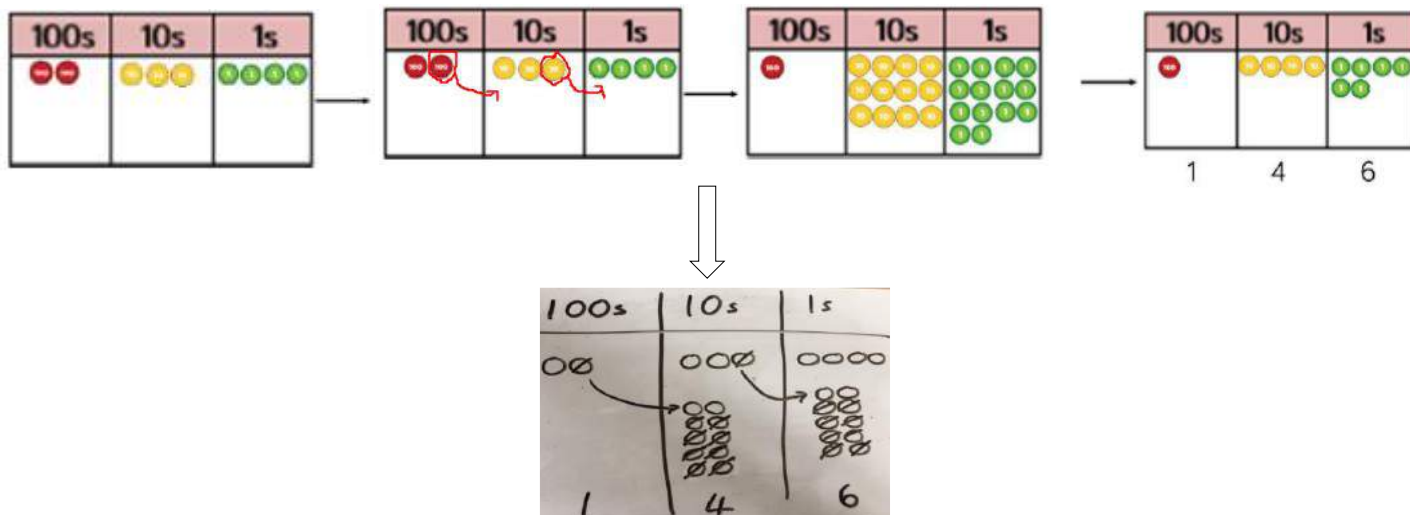
Continue to use manipulatives to demonstrate subtraction, **particularly the exchange of 1 ten for 10 ones**. This is essential at this stage so that children have a good, in-depth understanding of the process of regrouping for more formal written methods. Children should make subtractions of numbers up to **four digits**.



Children can also draw their own Dienes representations to solve subtraction calculations involving regrouping:



Lay place value counters out in columns in preparation for the later move to formal written column method. Children should also be encouraged to draw their own place value representations of the calculation.





Abstract

The expanded column method should be revisited. It is important to use manipulatives alongside to support children's understanding of the concept:

234 - 88

$$\begin{array}{r} 100 \quad 120 \\ 200 \quad 30 \quad 14 \\ - \quad 80 \quad 8 \\ \hline 100 \quad 40 \quad 6 \end{array}$$

Introduce compact column method alongside the expanded version so that the link between the two methods is clear. Discuss what is similar/different and why it is more efficient. Demonstrate without exchanging first:

784 - 351

$$\begin{array}{r} 700 \quad 80 \quad 4 \\ - 300 \quad 50 \quad 1 \\ \hline 400 \quad 30 \quad 3 \end{array} \quad \Rightarrow \quad \begin{array}{r} 784 \\ - 351 \\ \hline 433 \end{array}$$

Then demonstrate with regrouping:

854 - 286

$$\begin{array}{r} 700 \quad 140 \quad 1 \\ 800 \quad 50 \quad 4 \\ - 200 \quad 80 \quad 6 \\ \hline 500 \quad 60 \quad 8 \end{array} \quad \Rightarrow \quad \begin{array}{r} 7 \quad 14 \quad 1 \\ 854 \\ - 286 \\ \hline 568 \end{array}$$

Compare and discuss the suitability and efficiency of different methods in context. Pupils decide which methods to use and why.

Sam, Lucas and Jemima are solving the calculation

7000 - 3582

Here are their methods.

Sam	Lucas	Jemima
------------	--------------	---------------

Who is correct? Can you explain how each child has reached their answer? Whose method is the most efficient?



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Year 5

Concrete and Pictorial

Children should continue to use place value charts, both as concrete resources and in drawn examples, to arrange subtraction calculations. The modelling of the compact method should take place alongside these arrangements in order to make the link between the two explicit and to reinforce the concept of exchanging between the columns:

Tens of Thousands	Thousands	Hundreds	Tens	Ones
20000 20000	0000 0000 0000 0000		10 10 10 10 10 10	
	0000		10 10 10 10	1 1

25,060

1,022

Tens of Thousands	Thousands	Hundreds	Tens	Ones
20000 20000	0000 0000 0000 0000		10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1
	0000		10 10 10 10	1 1 1 1

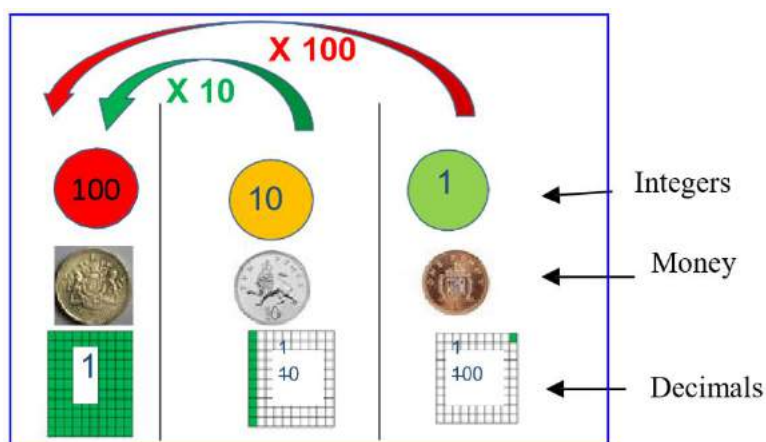
25,060
- 1,022

Tens of Thousands	Thousands	Hundreds	Tens	Ones
20000 20000	0000 0000 0000 0000		10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1
	0000		10 10 10 10	1 1 1 1

25,060
- 1,022
24,038

The numbers for subtraction should be mismatched in numbers of digits as the children progress in understanding of the compact method. Use of place value grids will help to ensure that children recognise the correct alignment of the digits.

The value of decimal columns should also be introduced with place value resources. Physical resources, particularly coins, for transactions involving subtraction will help children to realise the value of decimals.





Abstract

As well as ensuring that numbers are of 4 digits or more and are often mismatched in terms of number of digits, calculations should require children to regroup over more than one column's distance, as in the example below.

$$\begin{array}{r}
 \begin{array}{ccccccc}
 & 8 & & 11 & & 9 & \\
 4 & 9 & 2 & , & 0 & 2 & 8 \\
 - & 4 & 5 & , & 2 & 9 & 0 \\
 \hline
 4 & 4 & 6 & , & 7 & 3 & 8
 \end{array}
 \end{array}$$

Decimal subtraction should be included, with money giving a useful context for children to increase their understanding. Revert to expanded methods whenever difficulties arise Compare and discuss the suitability of different methods, (mental or written), in context.

£17.34—£12.16

What is the same
about these models?
What's different?

$$\begin{array}{r}
 1000+700+20+14p \\
 - 1000+200+10+6p \\
 \hline
 500+10+8p
 \end{array}$$

→

$$\begin{array}{r}
 \begin{array}{cc} & 2 \\ 17 & 34p \end{array} \\
 - 1216p \\
 \hline
 518p
 \end{array}$$

→

$$\begin{array}{r}
 £ \begin{array}{cc} 2 & \\ 17 & 34 \end{array} \\
 - 12.16 \\
 \hline
 5.18
 \end{array}$$

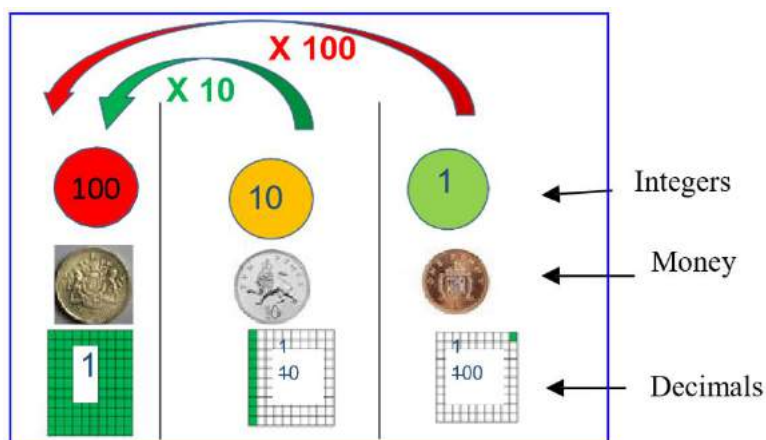
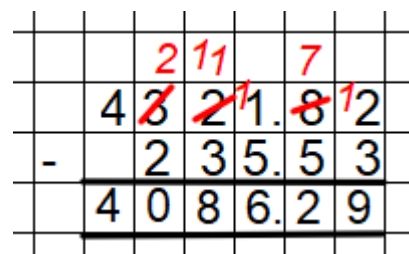
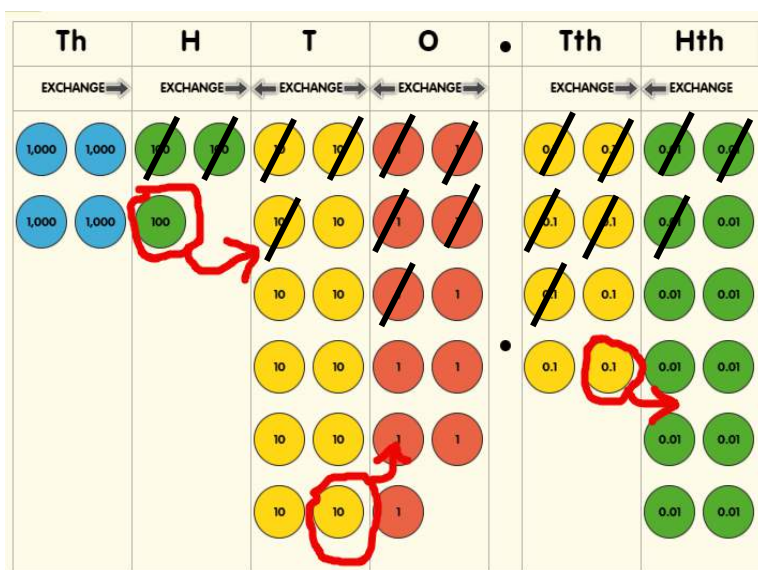
Counting on using a numberline should still be encouraged if the numbers are close together or near to multiples of 10, 100 etc.

I would count on using a number line to calculate 5003-4896 because the numbers are close

Children should be encouraged to make rough estimates by rounding appropriately **before** calculations.

Estimate: 130 – 80 = 50

$$\begin{array}{r}
 \begin{array}{ccccccc}
 & & & 1 & & & \\
 £ & 1 & 3 & 2 & . & 4 & 5 \\
 - & 8 & 1 & . & 7 & 5 \\
 \hline
 5 & 0 & . & 7 & 0
 \end{array}
 \end{array}$$



Abstract

Children should continue to extend the compact column method to numbers of increasing complexity. As well as ensuring that numbers are of 4 digits or more and are often mismatched in terms of number of digits, calculations should require children to regroup over more than one column's distance.

$$\begin{array}{r} \overset{8}{4} \overset{11}{9} \overset{9}{2}, \overset{1}{0} \overset{1}{2} 8 \\ - 45,290 \\ \hline 446,738 \end{array}$$

They should know that decimal points should line up under each other and pay particular attention to the occurrence of zeros as place holders, particularly when subtracting mixed amounts.

	~~1~~	~~10~~	15	.	~~3~~	4	11	9	kg
-		3	6	.	0	8	0		kg
		6	9	.	3	3	9		kg

Counting on using a number line should be encouraged if the numbers are close together or near to multiples of 10, 100 etc.

I would count on using a number line to calculate $5003 - 4896$ because the numbers are close

Children should be encouraged to make rough estimates by rounding appropriately **before** calculations.

Estimate: $130 - 80 = 50$

$$\begin{array}{r} \text{£ } 1^1 3^1 2^1 4^1 5 \\ - 81.75 \\ \hline 50.70 \end{array}$$



Multiplication

*Note to all staff: Children should have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts. It is important to use a range of models to develop understanding of multiplication, and that children make connections between arrays, number patterns, and counting in twos, fives and tens. **Multiplication should not be taught in isolation; it should be integrated into division and linked to repeated addition so that pupils feel confident to talk about it.***

EYFS

Pupils are given an opportunity to manipulate and experience a range of resources in real life contexts and through role-play. They are encouraged to solve real life problems. The link between addition and multiplication can be introduced through doubling and reinforced through repeated addition of the same number.



How many wheels are there altogether?



How much money do I have?



How many legs on four ducks?"

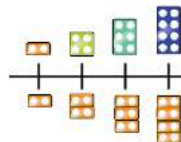
They will use many pictorial representations alongside their practical equipment.



Children will be introduced to the concept of doubling through practical activities using gloves, socks or other paired items. They will practically double a group of objects to find double of a number by combining and then counting the two groups. They will begin to relate this increase to 'twice' and 'two times'.



Children will begin to count in twos both aloud and with objects, such as Numicon or other concrete apparatus.



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"

Key Vocabulary: lots of, groups of, times, repeated addition, double, combine, twos, fives, tens

Key skills for multiplication in Foundation Stage:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Find the total number of items in two groups by counting all of them.
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations.



Prior Weston Primary School and Children's Centre Calculation Policy

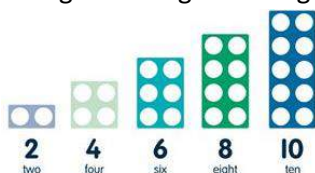
January 2019

Year 1

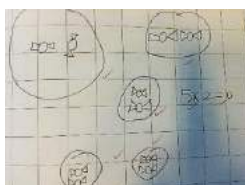
Concrete and Pictorial

Children will count in multiples of twos, fives and tens with equipment, songs & rhythms, and including by rote:

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



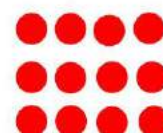
Children will also experience equal groups of objects - using pictorial representations, real life objects and manipulatives such as Numicon. They can demonstrate their understanding by drawing groups of objects.



With support, children will begin to translate this knowledge of equal groups into constructing and interpreting arrays. *Note: In later year groups, arrays will be used to move to bus stop method in division and grid multiplication in as smooth a transition as possible. In order to facilitate this, arrays should be referred to rows first, then columns*

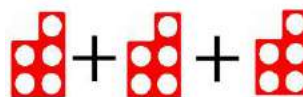
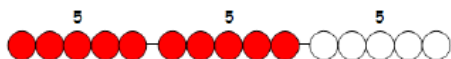


$4 \times 3 = 12$
"4 cakes, 3 times"
4 multiplied by 3



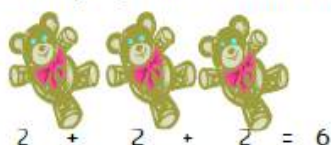
They will use images, bead strings and Numicon to help them understand multiplication as repeated addition.

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



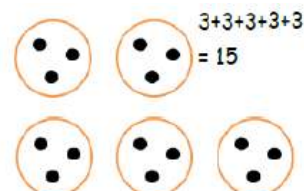
Children should be presented with practical problem solving activities involving counting equal sets or groups:

How many legs will 3 teddies have?



$$2 + 2 + 2 = 6$$

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

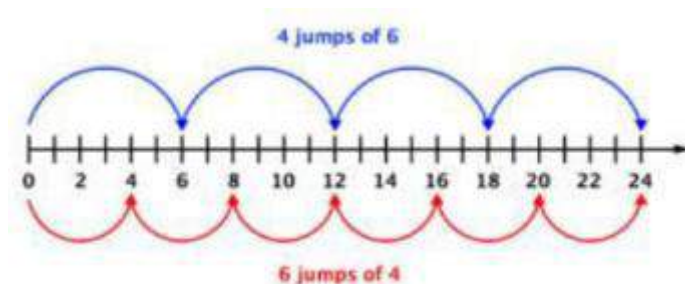
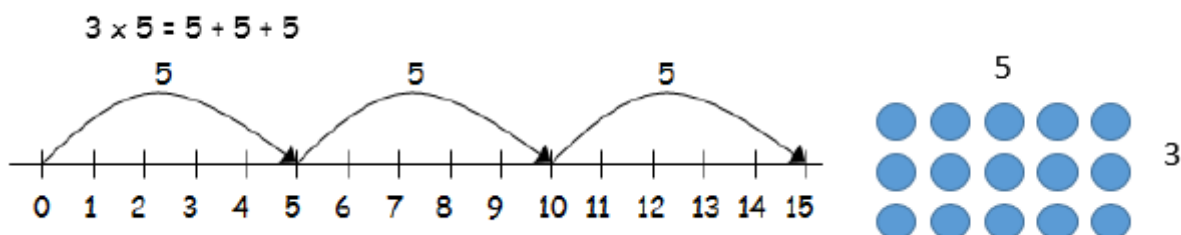


$$3 + 3 + 3 + 3 + 3 = 15$$



Abstract

Children will build upon their knowledge of repeated addition to show this on a numberline in relevant multiples (2s, 5s and 10s).



Number tracks can be used to represent counting in 2s, 5s and 10s. Teachers should draw attention to how the ones/tens digit changes or remains the same and children should be encouraged to look for patterns and rules.

10	20	30			
----	----	----	--	--	--

			35	45	55			
--	--	--	----	----	----	--	--	--

Children will be able to accurately write number sentences (both multiplication and repeated addition) to represent groups or an image.



Year 2

Concrete and Pictorial

Pictorial representations are used to place multiplication into context.

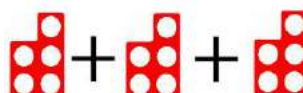
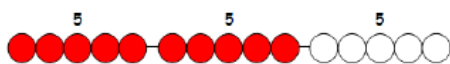


Children will use manipulatives to create equal groups of objects and will be able to draw and interpret pictorial representations.

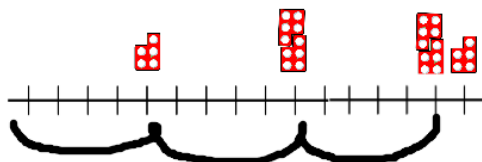


They will use images, bead strings and Numicon to consolidate their understanding of multiplication as repeated addition.

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



They will use manipulatives to help them develop their understanding of repeated addition on a number line.



Children should be able to read and model a multiplication calculation (both concretely and pictorially) using an array. Arrays should be used to develop children's understanding of multiplication as commutative. They should be able to discuss an array fluently and understand an array being expressed verbally in a range of ways e.g. '5 groups of 4', '4 shown 5 times', 5 multiplied by 4. *Note: In later year groups, arrays will be used to move to bus stop method in division and grid multiplication in as smooth a transition as possible. In order to facilitate this, arrays should be referred to rows first, then columns.*



4 x 3 = 12
"4 cakes, 3 times"
4 multiplied by 3



Arrays also lend themselves to

demonstrating the relationship between $\times$ and $\div$. Rotating them and drawing on them in different ways can be used to highlight the 'fact family' (four number sentences) shown by the arrays.



$$15 \div 5 = 3$$

$$15 \div 3 = 5$$

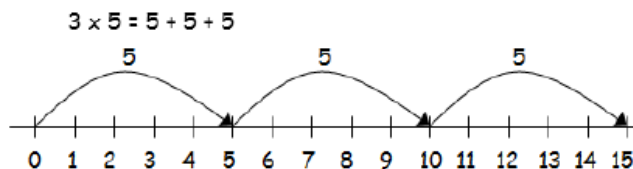
$$15 = 3 \times 5$$

$$15 = 5 \times 3$$

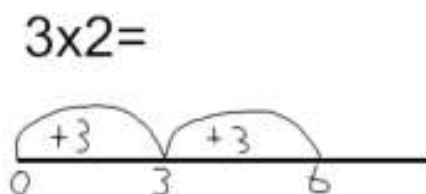
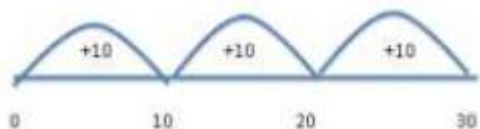


Abstract

Children will continue to develop their understanding of multiplication as repeated addition and this can be modelled on a number line. Links can be made to groups, arrays and counting in multiples.



If confident, some children can progress from using numbered number lines to blank number lines.



They will build on their understanding of the inverse to solve missing number problems. **Creating and using their own arrays** will help the children in this particularly.

$$\square \times 2 = 14 \quad 14 = 2 \times \square$$

$$\square \times \bigcirc = 14 \quad 14 = \square \times \bigcirc$$

Children will be confident using $\times$ and $=$ to express multiplication as a number sentence and in showing repeated addition sentences.

$$10 + 10 = 2 \times 10$$

$$10 \times 2 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2$$

$$5 + 5 + 5 + 5 = 4 \times 5$$

$$5 \times 4 = 4 + 4 + 4 + 4 + 4$$



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Year 3

Concrete and Pictorial

Children are confident in using objects to create equal groups and in representing these pictorially. They are able to use these groups to demonstrate their understanding of commutative law and of the inverse.

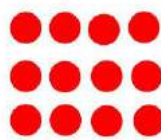


Children should continue to read and model a multiplication calculation (both concretely and pictorially) using an array. Arrays should be used to develop children's understanding of multiplication as commutative. They should be able to discuss an array fluently and understand it being expressed verbally in a range of ways e.g. '5 groups of 4', '4 shown 5 times', 5 multiplied by 4

Note: In later year groups, arrays will be used to move to bus stop method in division and grid



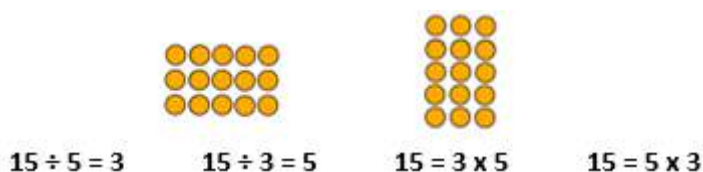
$4 \times 3 = 12$
"4 cakes, 3 times"
4 multiplied by 3



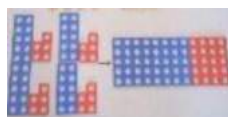
multiplication in as smooth a transition as possible.

In order to facilitate this, arrays should be referred to rows first, then columns.

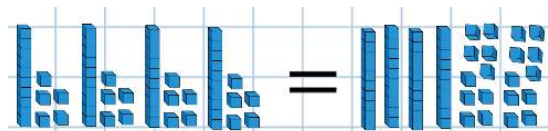
Arrays also lend themselves to demonstrating the relationship between $\times$ and $\div$. Rotating them and drawing on them in different ways can be used to highlight the 'fact family' (four number sentences) shown by the arrays.



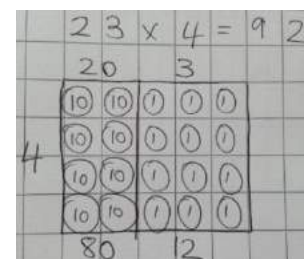
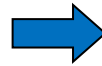
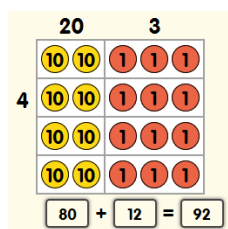
Children begin to multiply 2-digit numbers by 1-digit numbers using manipulatives such as place value counters and dienes.



15×4



Using the manipulatives they build on their knowledge of arrays to solve 2-digit $\times$ 1-digit. This format prepares children for using the grid method later on.





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Abstract

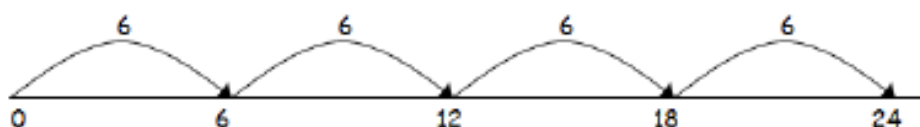
Children can use an informal written method involving partitioning to solve 2-digit by 1-digit multiplication questions.

$$\begin{aligned} 38 \times 5 &= (30 \times 5) + (8 \times 5) \\ &= 150 + 40 \\ &= 190 \end{aligned}$$

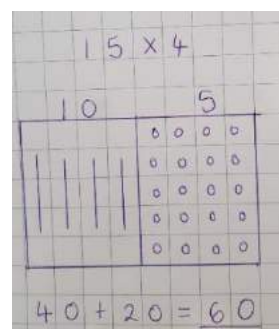
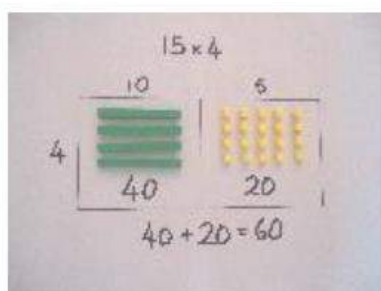
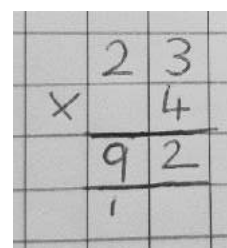
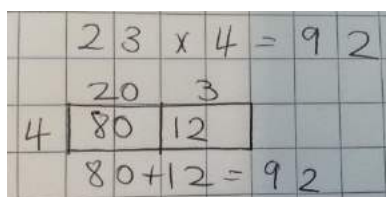
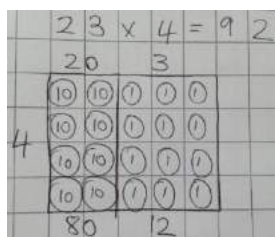
They will use symbols to stand for unknown numbers to complete equations using inverse operations.

$$3 \times \triangle = 18 \quad \square \times 5 = 20 \quad \square \times \bigcirc = 32$$

Children continue to use repeated addition, using empty number lines to support their understanding.



Linked to the use of arrays formed in the concrete/pictorial stage of learning, children will move onto the expanded grid method to multiply 2-digit numbers by 1 digit numbers. When children are confident **and** accurate when multiplying 2 and 3-digit numbers by a single digit this way, **and** are already confident in compact column method for addition, they can move onto short multiplication (including making exchanges).





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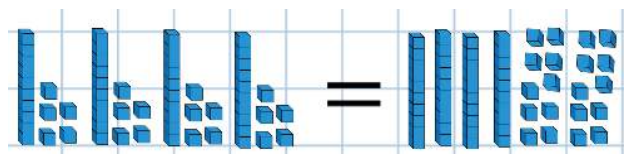
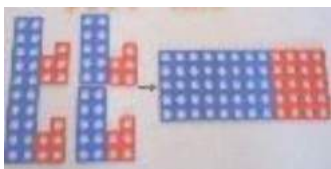
January 2019

Year 4

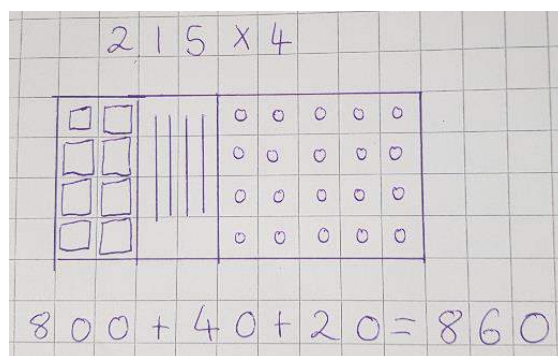
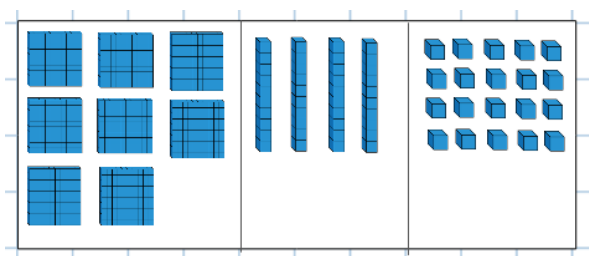
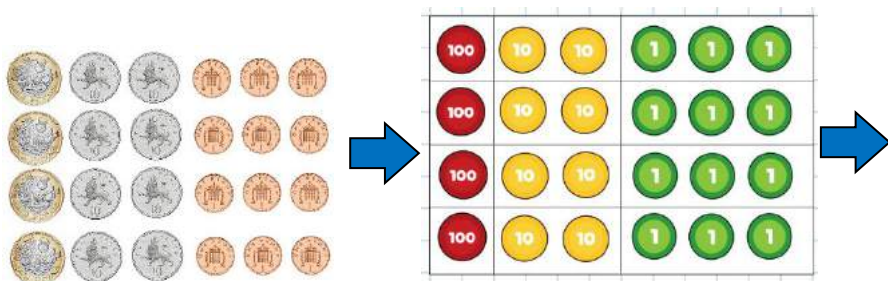
Concrete and Pictorial

Children practise multiplying 2- and 3-digit numbers by 1-digit numbers using manipulatives such as place value counters and dienes. They use these to consolidate their understanding of the relationship between multiplication and division.

$$15 \times 4$$



Using manipulatives, they build on their knowledge of arrays to solve 2- or 3-digit by single digit multiplication. Multiplying using the least significant digit first for the grid method will support children with implementation of the written procedure. *Note: Arrays will be used to move to bus stop method in division and grid multiplication in as smooth a transition as possible. In order to facilitate this, arrays should be referred to rows first, then columns*





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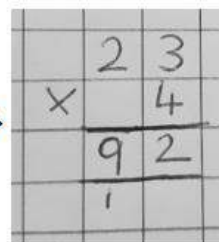
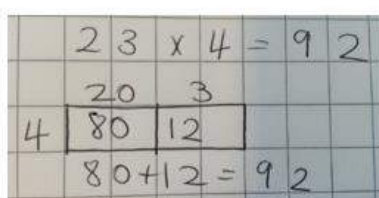
January 2019

Abstract

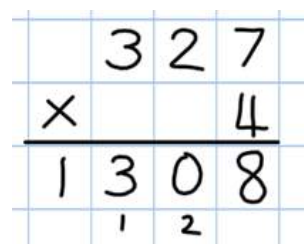
They can use an informal written method involving partitioning to solve 2-digit by 1-digit multiplication questions.

$$\begin{aligned} 38 \times 5 &= (30 \times 5) + (8 \times 5) \\ &= 150 + 40 \\ &= 190 \end{aligned}$$

Building on their use of arrays in the concrete/pictorial stage of learning, children will use the expanded grid method to multiply 2-digit/3-digit numbers by 1 digit numbers. When children are confident **and** accurate when multiplying 2 and 3-digit numbers by a single digit this way, **and** are already confident in compact column method for addition, they can move onto short multiplication (including making exchanges).



x	300	20	7
4	1200	80	28





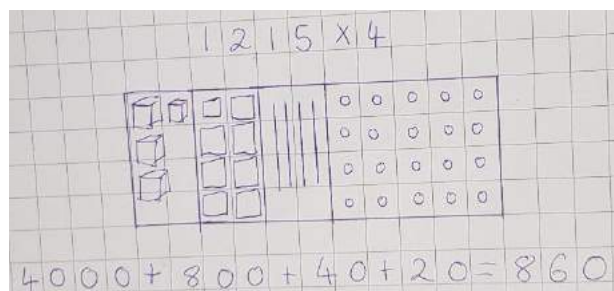
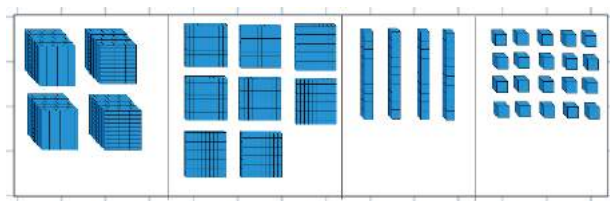
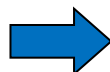
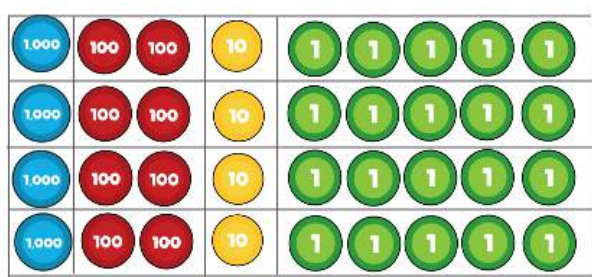
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Year 5

Concrete and Pictorial

Children can use manipulatives to multiply numbers up to 4 digits by single digit. Laying them out in this format consolidates their understanding of the grid method and of column multiplication (both extended and compact). Multiplying using the least significant digit first will support children with implementation of the written procedure.





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Abstract

Children can use an informal written method involving partitioning to solve multiplication questions.

$$\begin{array}{r}
 215 \times 4 \\
 \swarrow \quad \downarrow \quad \searrow \\
 200 \quad 10 \quad 5
 \end{array}
 \quad
 \begin{array}{l}
 200 \times 4 = 800 \\
 10 \times 4 = 40 \\
 5 \times 4 = 20 \\
 800 + 40 + 20 = 860
 \end{array}$$

Children will be introduced to more formal written methods for short multiplication and long multiplication for numbers up to 4 digits by 1 or 2 digits. They must be taught to approximate first in order to minimise errors.

Grid multiplication (moving from expanded to compact) when multiplying by 10 or less:

x	300	20	7
4	1200	80	28

➔

	3	2	7
x			4
1	3	0	8
	1	2	

When multiplying by 2- or 3-digit numbers, children will use column method ('long multiplication'):

Use the grid to introduce long multiplication, as the relationship can be seen in the answers in each row.

x	10	8
10	100	80
3	30	24



		1	8
x		1	3
		5	4
		2	
	1	8	0
	2	3	4

18 x 3 on the 1st row
(8 x 3 = 24, carrying the 2 for twenty, then '1' x 3).
18 x 10 on the 2nd row.
Put a zero in the units column first, then say 8 x 1, and 1 x 1.

When confident, they will progress from using the expanded method to the compact method where they are carrying within the addition:

x	1 1 5	➔	x	2 1 5
	4			4
	2 0 (5 x 4)			8 6 0
	4 0 (10 x 4)			2
	8 0 0 (200 x 4)			
	8 6 0			



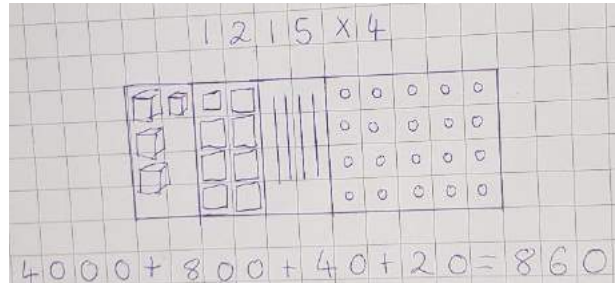
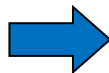
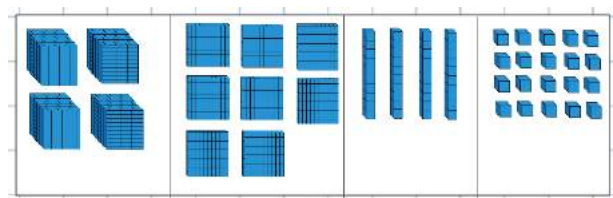
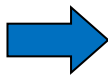
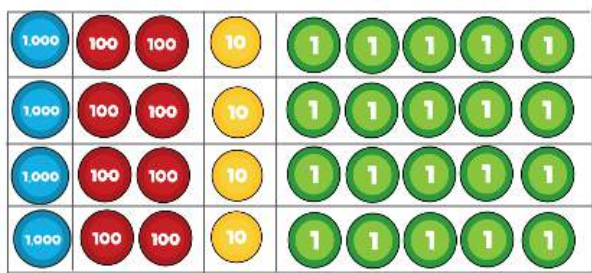
Prior Weston Primary School and Children's Centre Calculation Policy

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Year 6

Concrete and Pictorial

Children can use manipulatives to multiply numbers up to 5 digits by single digit. Laying them out in this format consolidates their understanding of the grid method and of column multiplication (both extended and compact). Multiplying using the least significant digit first will support children with implementation of the written procedure.





Abstract

Children will use the formal methods for short and long multiplication to answer questions involving more complex numbers (greater than 4 digits) including multiplying one-digit numbers with up to two decimal places by whole numbers and multiplying using mismatched decimals. They should also be multiplying money and measures. They must continue to approximate first.

$$\begin{array}{r} 3652 \\ \times 8 \\ \hline 29216 \\ 54 \end{array}$$

$$\begin{array}{r} 1234 \\ \times 16 \\ \hline 7404 \\ 12340 \\ \hline 19744 \end{array}$$

x	8	0.4	0.06	
11	88	4.4	0.66	= 93.06

8.46
x 11
93.06

What's the same?
What's different?

$$\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \\ 1 \quad 7 \end{array}$$

If children are finding the short method difficult, they can revert to expanded column (long) multiplication to consolidate their understanding first.

	H	T	U		H	T	U
		2	6			2	6
x		1	3	→	x		1
		1	8	(6 x 3)		7	8
		6	0	(20 x 3)		1	
		6	0	(6 x 10)		2	6
	2	0	0	(10 x 20)		3	3
	3	3	8			1	



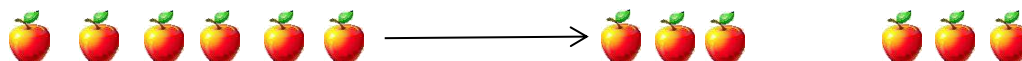
Division

Note for all teaching staff: Pupils do have problems developing an understanding of division. Division should not be taught in isolation; it should be integrated into multiplication and linked so that pupils feel confident to talk about division. One problem with division is that it can be seen in two ways – SHARING and GROUPING – that can come to be seen as discrete by the pupils, who may favour one over the other. Therefore extensive practical tasks and opportunities for pupils to grasp these concepts as well as using the correct vocabulary to interpret the pictures, jottings and written methods in answer to problems set.

At all stages of learning division, children should be encouraged to group numbers in organised or familiar patterns in order to encourage fluency in number.

EYFS

Children will engage in a wide variety of songs and rhymes, games and activities, being given an opportunity to manipulate and experience a range of resources. Objects should be used to begin discussing the key concepts of **sharing** and **halving**:



"Share the apples between two people."

"Half of the apples for you and half of the apples for me – that means 3 each."

Solve problems involving **sharing** in a practical context:



Give each bear a sweet. How many sweets do we need?

If each bear has two sweets each, how many will we need then?

Extend this to challenge children by forming unequal halves (or groups):



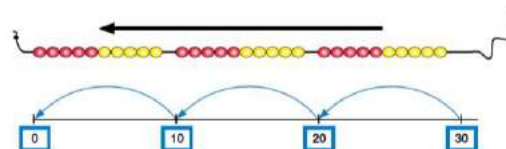
How have Prenash and Jane shared their cakes?

How can we help them to have half each?

Dividing is a quick way of subtracting several lots of the same number or quantity, or splitting it up into equal groups.

Multiplying and dividing are the inverse or opposite of each other.

Introduce this by counting back in 2s or 10s:



Key Vocabulary: halve, share, share equally, one each, two each, three each, group in pairs / threes / tens, equal groups of, in equal parts, left, left over

Key skills for division in Foundation Stage:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations

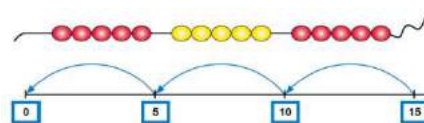
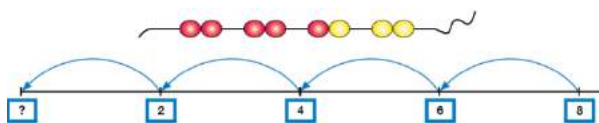


Year 1

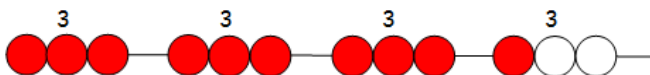
Concrete and Pictorial

Children will use objects, diagrams and pictorial representations to solve problems involving both grouping and sharing. They will understand equal groups and share items out in play and problem solving. As they do so, teachers will introduce the **symbol for division** as part of a number sentence describing the demonstration. Using 'first, then, finally' story frames are helpful in supporting understanding of this.

The concept and language of **division** should be introduced as **sharing a number equally** and shown using repeated subtraction with a variety of resources, beginning by counting back in multiples of 2, 5 and 10:



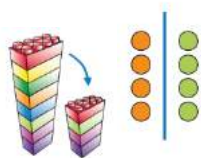
"12 divided into 4 equal groups gives 3 in each group"



"How many 2s in 4?"



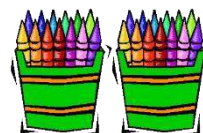
Children should consolidate knowledge of halves by using manipulatives and pictorial representations. This may be recorded (by adults at first) as a sentence using numbers (but not the symbol for division – year 2). They will know all halves to 20 by heart:



"Half of 8 is 4."

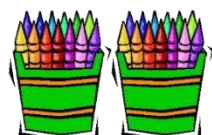


"6 divided by 2 is 3."

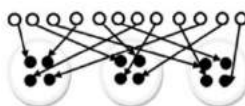


"20 crayons shared into 2 pots is 10."

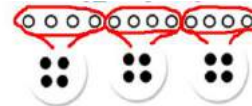
Use practical resources to begin to guide children to the difference between **sharing** and **grouping**:



"Put 20 crayons into groups of 10.
How many pots do we need?"

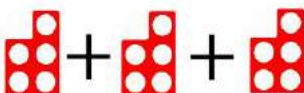


"Share 12 beads into 3 bowls."



"Make groups of 4 from 12 beads.
How many bowls?"

Make **explicit links** between the repeated addition of multiplication and grouping within division, using the same resources to reinforce the links: $5 + 5 + 5 = 3 \text{ groups of } 5 = 3 \times 5 = 15$





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Moving from Pictorial to Abstract

In Year 1 children will primarily record **pictorially**.

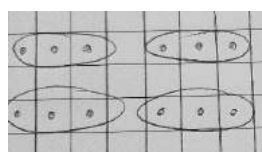
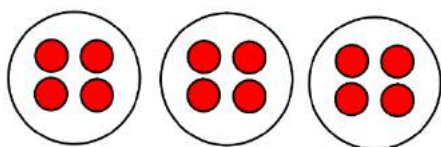
Encourage children to develop their own ways of recording (moving towards fluent, symbolic notation in Year 2).



Pictorial jottings to support the calculation of $8 \div 4$

To support children's understanding of division as an abstract number sentence use a 'first, then, finally' story frame to put the calculation into the context of a number story.

Model drawing circles/groups/areas for placing concrete resources:



"You have 12 counters. You are going to share them into 3 groups. How many circles do you need to draw?" "Can you share them into a different number of groups?"

"Complete: ____ shared between ____ is ____."

Note: Encourage children to draw/arrange counters in organised/familiar patterns (see beginning of division section). This supports fluency and will encourage movement into arrays for further recording.

Conceptual understanding and recording should be continuously supported by the use of arrays as a default model, as well as other representations. **Note: In later year groups, arrays will be used to move to short division (bus stop method) in as smooth a transition as possible. In order to facilitate this, arrays should be referred to rows first, then columns (see year 3/4 and also multiplication).**

Use printed resources in arrays so that children can draw groupings to assist in answers:



"How many faces altogether?
How many groups of two?"



"Five groups of two."

Children may then be asked to solve more abstract questions without prompting and encouraged to use either of the above methods (**grouping** or **arrays**) to find the answers:

"Miss Patel has 10 smiley face stickers to give out. She is going to give the same number to each of 2 children. How many does each child get?"

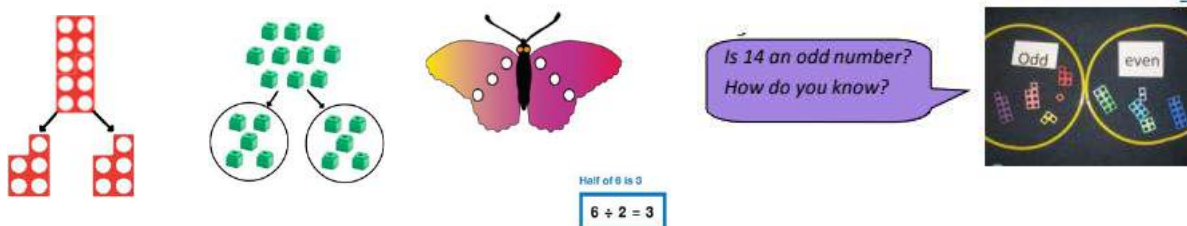


Year 2

Concrete and pictorial

Children will use a range of vocabulary to describe division and use practical resources, pictures and diagrams to demonstrate their understanding. As they do so, teachers will use the **symbol for division** as part of a number sentence describing the demonstration: Using 'first, then, finally' story frames are helpful in supporting understanding of this.

Discuss halving and how this also relates to odd and even numbers.



The difference between sharing and grouping should be made more explicit with recording by the adult again explicitly modelled:



"30 crayons shared equally between three pots." **(Sharing)**

"We have 30 crayons and put ten crayons in each pot. How many pots do we need?" **(Grouping)**

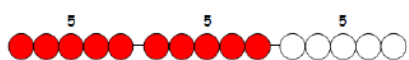
"30 divided by 3 = 10 → 30 ÷ 3 = 10"

"30 divided by 10 = 3 → 30 ÷ 10 = 3"

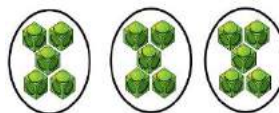


*How many groups of 3 can I make from 15?
How many times can I share 15 between 3?*

Children can use a range of manipulatives to continue to build links between repeated addition/subtraction, multiplication and division including cubes, bead strings and numicon.



$$15 \div 3$$



Arrays are also beneficial for this as they may be rotated to indicate the complementary division facts

$$15 \div 3 = 5$$



$$15 \div 5 = 3$$



Four number sentences ('fact families') may be recorded:

$$15 \div 5 = 3$$

$$15 \div 3 = 5$$

$$15 = 3 \times 5$$

$$15 = 5 \times 3$$

Lollysticks can be used concretely to divide and then represented pictorially, e.g. $12 \div 4$:





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Moving from Pictorial to Abstract

Counting in multiples

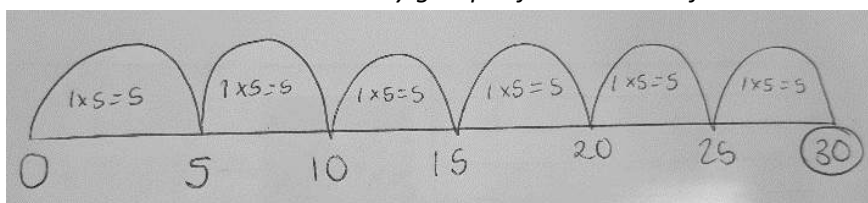
After practising this as chanting, times tables or with resources to support, children will be able to solve a division calculation by counting up from 0 in multiples of the divisor. In this case, 3 is the divisor so the child counts in multiples of 3. They may support themselves by counting on their hand or recording in another basic way **that does not slow their ability to count in multiples**.



This can be translated into the use of a number line. This method consolidates children's understanding of division as grouping. It also supports children's understanding of the relationship between multiplication and division.

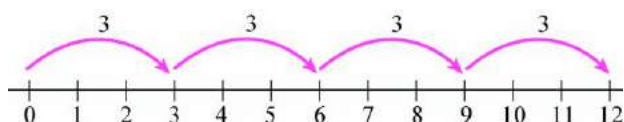
"30 ÷ 5"

"How many groups of 5 can I make from 30?"

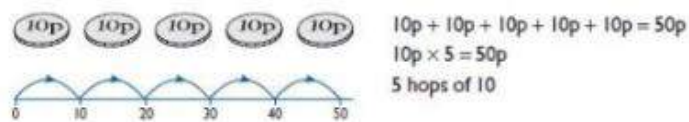


"12 ÷ 3"

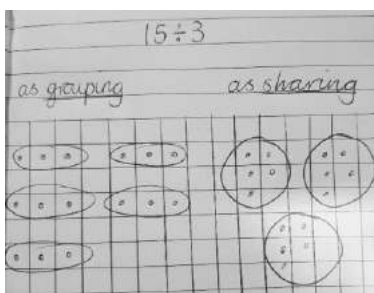
"How many lots of 3 in 12?"



"How many 10p coins will make 50p?"



Answers to questions will be recorded **pictorially** as either grouping/sharing or in the form of arrays:



$$3 \times 4 = 12$$

$$12 \div 3 = 4$$



$$4 \times 3 = 12$$

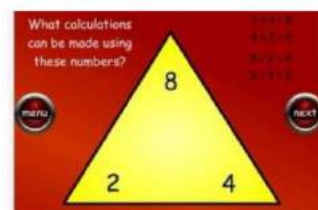
$$12 \div 4 = 3$$

As children become more confident they will use symbols to stand for unknown numbers to complete equations using inverse operations:

$$\square \div 2 = 4$$

$$20 \div \triangle = 4$$

$$\square \div \triangle = 4$$





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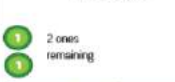
Year 3

Concrete and Pictorial

Exploration with a variety of manipulatives supports the progression to formal written methods – which is continued in Year 4. Children will practise dividing 2-digit numbers by a single digit.

Using place value counters:

$$94 \div 4$$

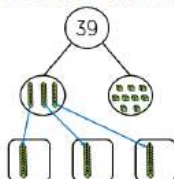
Step 1 Build the number and show the groups on the place value chart	Step 2 Share the tens	Step 3 Exchange the tens into ones and share the ones																								
$94 \div 4 =$  T O <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>									$94 \div 4 =$ 1 ten left - exchange into ones  T O <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>									$94 \div 4 = 23 \text{ r } 2$ 2 ones remaining  T O <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>								

$$42 \div 3 = 14$$

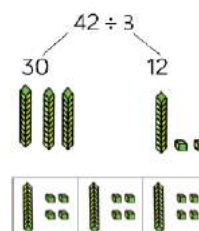
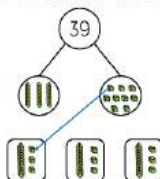
10s	1s
○	○ ○ ○ ○
○	○ ○ ○ ○
○	○ ○ ○ ○

Using dienes:

Step 1: Share the tens

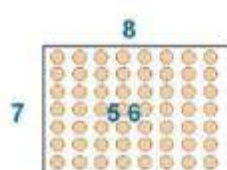


Step 2: Share the ones



Using arrays:

To support the transition to written method, it is important that children also build their own arrays using concrete resources, recognise pictorial representations of arrays and draw their own arrays:



$$\begin{array}{r} 8 \\ 7 \overline{) 56} \end{array}$$

"Show me an array in groups 7."

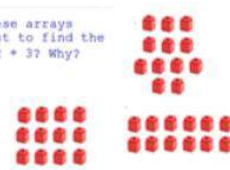
"Make 7 equal groups."

"How many is one-seventh of the whole?"

Remember to guide children to make groups of the divisor in rows (horizontally).

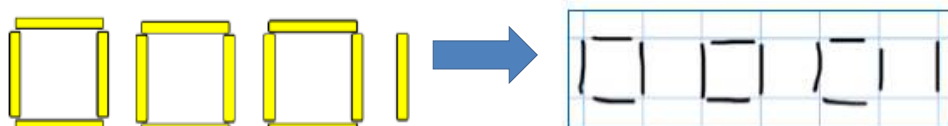
Continue to make the link to multiplication explicit and show that all four number sentences can be made when using concrete resources and offer alternatives to promote explanation of number:

Which of these arrays would be best to find the answer to $12 \div 3$? Why?



$$\begin{aligned} 20 &= 4 \times 5 \\ 5 \times 4 &= 20 \\ 20 \div 4 &= 5 \\ 4 &= 20 \div 5 \end{aligned}$$

Lollysticks can be used concretely to explore division with remainders and then represented pictorially, e.g. $13 \div 4$:





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Abstract

Note: Pupils should be taught to recall and use multiplication and division facts for the 3, 4 and 8 times tables. They should develop efficient mental methods, for example, using commutativity and associativity and multiplication and division facts to derive related facts. **This will support their ability to later carry out short division (bus stop method) efficiently.** It will also allow them to identify and reason about errors in their $\times$ and $\div$ work.

$$36 \div 3 = 12$$

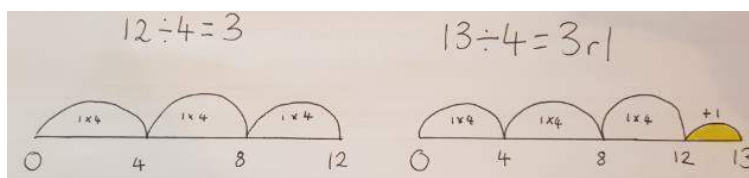
$$30 \quad 6$$

$$30 \div 3 = 10 \quad 6 \div 3 = 2$$

"4 $\times$ 3 is 12, so
 $12 \div 3 = 4$."

"I know $6 \div 3 = 2$,
so $60 \div 3 = 20$."
"I know $12 \div 3 = 4$,
so $120 \div 3 = 40$."

Numberlines can be used to show division both with and without remainders. Use this method to make links to grouping and the relationship between multiplication and division.



The teacher should draw links to the drawing of arrays completed in the pictorial stage - clearly modelling that the short division can be superimposed onto the array to show the division before demonstrating the short division separately.

$$3 \begin{array}{|c|c|c|c|c|c|} \hline \text{20} & \text{10} & & & & \\ \hline \text{60} & & & & & \\ \hline \text{30} & \text{30} & & & & \\ \hline \end{array} = 3 \overline{)63}$$

21

Encourage children to use fact families and inverse to check their answer.

$$\begin{array}{l} 30 \div 5 \\ 5 \times 6 = 30 \\ 6 \times 5 = 30 \\ 30 \div 5 = 6 \\ 30 \div 6 = 5 \end{array} \quad \begin{array}{r} 6 \\ 5 \overline{)30} \end{array}$$

When using short division, children should start with numbers that don't involve carrying (each digit is a multiple of the divisor). They will extend this method to calculations where there is no remainder in the final answer, but with remainders occurring within the calculation. Questions should include money and measures contexts when they are confident.

$$\begin{array}{r} 32 \\ 3 \overline{)96} \end{array}$$

$$\begin{array}{r} 18 \\ 4 \overline{)72} \end{array}$$



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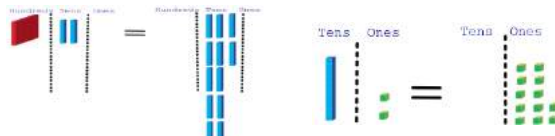
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Year 4

Concrete and Pictorial:

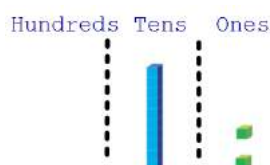
By working through larger calculations with manipulatives, children gain experience of exchange.

To move towards short division (bus stop method) with remainders, ensure children are secure in place value by demonstrating exchange between columns using dienes and place value counters.



Once this is secure, continue to use the materials in the context of division, returning back to grouping and arrays in order to refer back to their work in year 3 when learning short division:

$$12 \div 3 = \underline{\quad}?$$



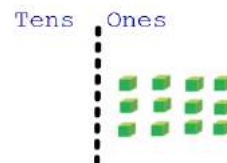
"How many tens do we have?"

"How many ones?"

"How many groups of three can we make from the tens?"

"If we exchange the 10s for 1s, can we make groups of three?"

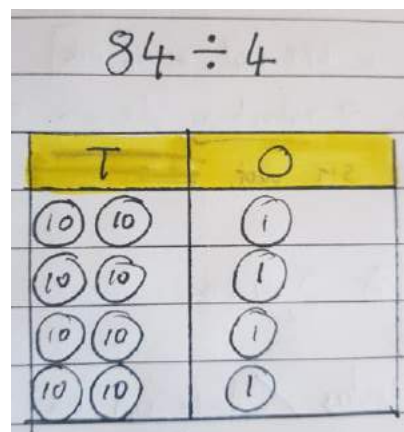
"How many groups of three can we make?"



Once children are secure with this they can be moved onto 3 digit numbers.

Using place value counters without exchanging:

Step 1 Build the number	Step 2 Share the tens	Step 3 Share the ones
$84 \div 4$ 		



$$91 \div 7 = 13$$

Using place value counters with exchanging:

T	O
1	1
1	1
1	1
1	1
1	1
1	1
1	1
1	1

1. Share the tens

2. Two tens left over

3. Exchange for 20 ones

4. Share the ones



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Abstract

Pupils should be taught to recall and use multiplication and division facts for all tables up to 12×12 . They should develop efficient mental methods, for example, using commutativity and associativity and multiplication and division facts to derive related facts. **This will support their ability to later carry out short division (bus stop method) efficiently.** It will also allow them to identify and reason about errors in their $\times$ and $\div$ work.

$$36 \div 3 = 12$$

$$30 \quad 6$$

$$30 \div 3 = 10 \quad 6 \div 3 = 2$$

" 4×3 is 12, so
 $12 \div 3 = 4$."

"I know $6 \div 3 = 2$,
so $60 \div 3 = 20$."
"I know $12 \div 3 = 4$,
so $120 \div 3 = 40$."

By the end of Year 4, children need to have encountered remainders in a number of contexts. Pupils can be introduced to remainders using known facts: e.g. $13 \div 4$; and then progress to larger numbers.

Move children into short written method (bus stop method), carrying numbers over to the next column and incorporating the multiples of numbers new to this year group (6, 7 and 9) with dividends up to three numbers. Model very clearly and repeatedly the exchange of resources whilst modelling the written recording of this:

$120 \div 4$

$492 \div 4$

When the answer for the first column is zero, children should write a zero above to acknowledge its place and must always carry the number over to the next digit as a remainder:

Some calculations may result in a remainder at the end of the calculation. This should only be expressed as a simple remainder:



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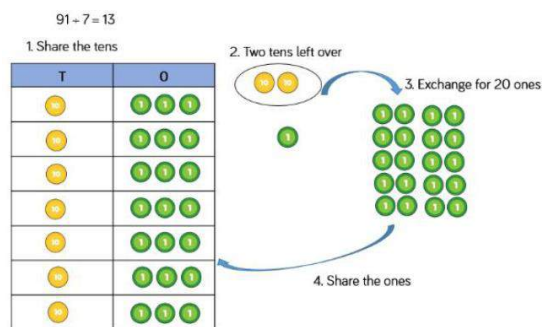
Year 5

Concrete and Pictorial

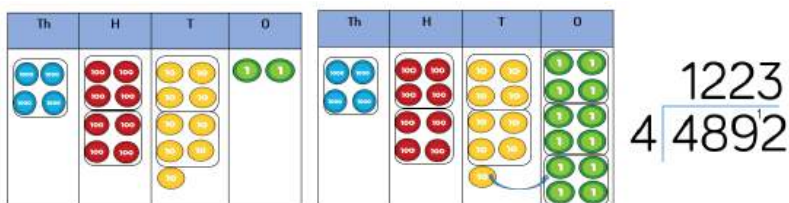
By working through larger calculations with manipulatives, children gain experience of exchange. This practical experience is also vital for children to talk through the language of division e.g. exchange, remainder; and to embed conceptual understanding.

Children can use place value counters to explore dividing (up to) 4-digit numbers by a single digit. Refer to Year 4 section to see how to also use dienes.

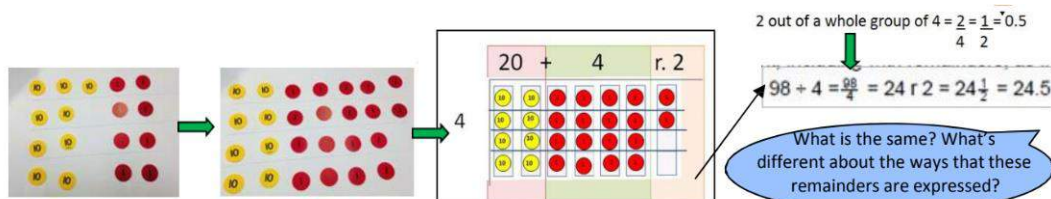
Method 1:



Method 2:



Children will use manipulatives to support them in expressing remainders in a variety of ways, including as fractions or decimals. Children should be clear that groups are being made that are the size of the divisor, so that when more remain they are a part of an unfinished group:



How many cubes are there in the full columns?"

"How many cubes are in a column that is not full?"

"How could we write this remainder as a fraction?"

"What would it be as a decimal?"

$$20 \div 6$$



Dienes and hundred squares can be used to support understanding of remainders as decimals.

Ones . Tenths
1 . 0

Ones . Tenths
0 . 2

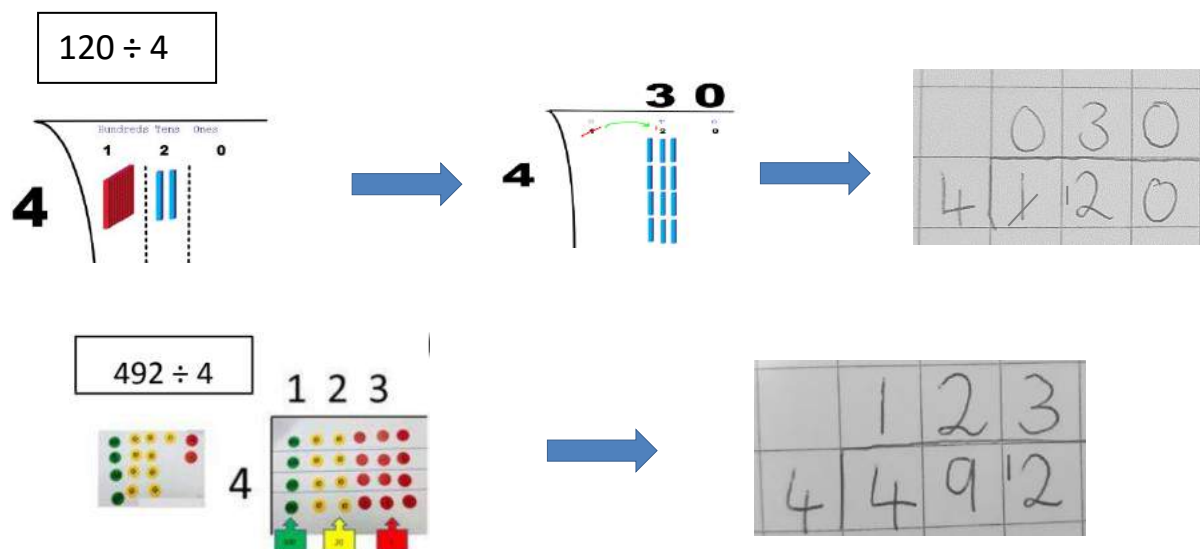
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

61	62	63	64	65	66	67	68	69	70
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Abstract

Children continue to use the short division method with single-digit divisors and dividends up to 4-digits. Introduce short division (bus stop method) with initial reference to the concrete and pictorial stages. Model clearly the exchange of resources whilst simultaneously modelling the written recording of this:



Then move onto solely recording abstractly. When the answer for the first column is zero, children should write a zero above to acknowledge its place and must always carry the number over to the next digit as a remainder. Some calculations may result in a remainder at the end of the calculation.

Two examples of short division recorded abstractly on grid paper:

- $5 \overline{)185}$ with the answer 037.
- $8 \overline{)5309}$ with the answer 0663 r 5.

If children are confident then you could challenge them to (using the same method) to record the remainder as a fraction.

A handwritten example of short division on grid paper: $5 \overline{)276}$ with the answer 055 $\frac{1}{5}$.

Once the exchange between decimal columns has been practised sufficiently, clear modelling of carrying the remainder past the decimal point can be modelled and practised by confident students. They should use the context of the question to interpret the remainder appropriately:

A handwritten example of short division on grid paper: $5 \overline{)276.0}$ with the answer 055.2.

Pupils should be able to apply multiplication tables and related division facts to their calculations and use them to reason about, and check, an answer.

A diagram showing how to check a division problem using multiplication:

If $42 \div 6 = 7$
 $\div 10$ $\div 10$
 Then $4.2 \div 6 = 0.7$

"I know that the answer to $138 \div 6$ will be close to 20, because $2 \times 6 = 12$, so $20 \times 6 = 120$."



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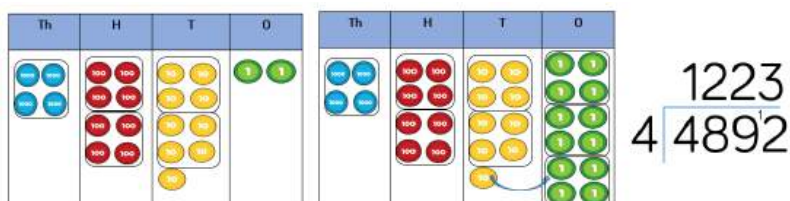
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Year 6

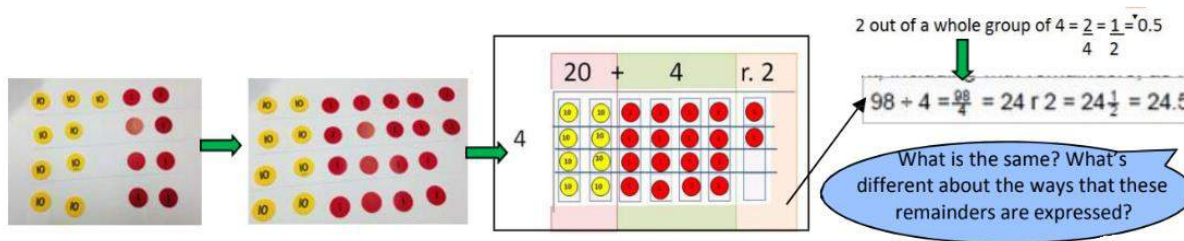
Concrete and Pictorial

By working through larger calculations with manipulatives, children gain experience of exchange. This practical experience is also vital for children to talk through the language of division e.g. exchange, remainder; and to embed conceptual understanding.

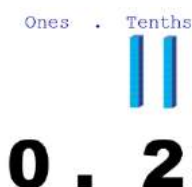
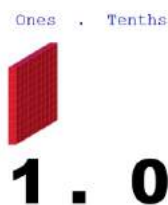
Children can use place value counters to consolidate dividing (up to) 4-digit numbers by a single digit:



Children will use manipulatives to support them in expressing remainders in a variety of ways, including as fractions or decimals. Children should be clear that groups are being made that are the size of the divisor, so that when more remain they are a part of an unfinished group:



Dienes and hundred squares can be used to support understanding of remainders as decimals.



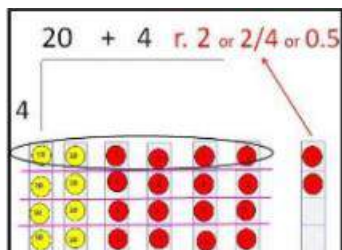


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Abstract

To introduce the long division model, use a simple calculation which can be represented both with manipulatives and by a short division algorithm. Use questioning and discussion to compare the methods.



$$\begin{array}{r} 24 \text{ r. } 2 \\ 4 \overline{) 98} \end{array}$$

$$\begin{array}{r} 24 \text{ r. } 2 \\ 4 \overline{) 98} \\ \underline{- 80} \quad (4 \times 20) \\ 18 \\ \underline{- 16} \quad (4 \times 4) \\ 2 \end{array}$$

What's the same? What's different?

Model clearly how to divide a 4 digit number by a 2-digit number using **long division**:

$$\begin{array}{r} 2 \\ 15 \overline{) 3640} \\ \underline{- 30} \\ 6 \end{array}$$

15 into 3 doesn't go, so look at the next digit.

15 goes into 36 two times, so put a 2 above the 6.
 $15 \times 2 = 30$

Take that 30 away from the 36 to get your remainder.
 $36 - 30 = 6$

$$\begin{array}{r} 24 \\ 15 \overline{) 3640} \\ \underline{- 30} \\ 64 \\ \underline{- 60} \\ 4 \end{array}$$

Next, carry the 4 down to make 64.
15 goes into 64 four times, so put a 4 above the 4.
 $15 \times 4 = 60$

Take 60 from the 64 to get your remainder.
 $64 - 60 = 4$

$$\begin{array}{r} 242 \\ 15 \overline{) 3640} \\ \underline{- 30} \\ 64 \\ \underline{- 60} \\ 40 \\ \underline{- 30} \\ 10 \end{array}$$

Carry the 0 down to make 40.

15 goes into 40 two times, so put a 2 above the 0.
 $15 \times 2 = 30$

Take 30 from the 40 to get your remainder.
 $40 - 30 = 10$

When given examples that give rise to remainders, children should consider the meaning of the remainder within the context of the problem and decide how to express it, i.e. simply, as a fraction, a decimal, or (when confident) as a rounded number or value:

$$\begin{array}{r} 055 \text{ r. } 1 \\ 5 \overline{) 276} \end{array}$$

$$\begin{array}{r} 055 \frac{1}{5} \\ 5 \overline{) 276} \end{array}$$

$$\begin{array}{r} 055.2 \\ 5 \overline{) 276.0} \end{array}$$



Supporting long division:

Written method for long division requires use of multiples of the divisor. Encourage children to use simple mental maths skills to create a quick guide to the divisor's multiples. Although incomplete, it can be done in a short space of time by most children and give guidance for the calculation:

1	14
2	
3	
4	
5	70
6	
7	
8	
9	
10	140

Ensure that children write the number of the multiple (red) so that it is linked to the multiple. This will make writing the answer quicker and more accurate.

Once this is done, they can use doubling to find the 2nd, 4th and 8th multiples. This provides a good starting point for division. The 3rd multiple can easily be found by adding the first and second multiples. The missing multiples (6, 7 and 9) can be found if needed – children should begin to divide as finding all multiples is time-consuming and most often not necessary.

1	14
2	28
3	
4	56
5	70
6	
7	
8	112
9	
10	140

Complete the calculation:

Jottings/Guide

1	14
2	28
3	
4	56
5	70
6	
7	
8	112
9	
10	140

Calculation

$$\begin{array}{r}
 88 \\
 14 \overline{) 1232} \\
 \underline{-112} \\
 112 \\
 \underline{112} \\
 0
 \end{array}$$