

Upperwood Calculation Policy 2023

Multiplication & Division



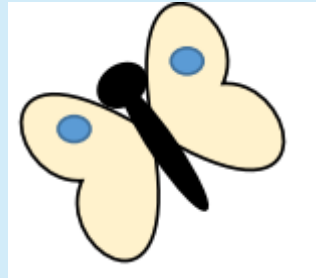
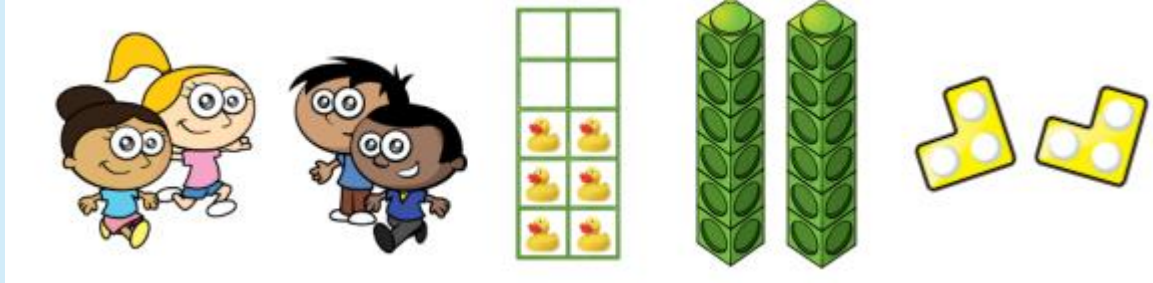
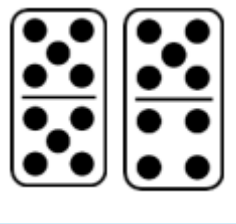
This document gives an overview of the different models, visuals and operations used to teach addition and subtraction at Upperwood Academy. This policy forms the basis of how we adapt and teach the White Rose Maths scheme of learning.



Progression of Multiplication Skills	Year	Representations & Models	
Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.	EYFS	Range of objects to count Number shapes Arrays Ten frames Bead strings Dice	Snap games Reflective art activities
Solve one-step problems with multiplication	1/2	Bar model Number shapes Counters	Ten frames Bead strings Number lines
Multiply 2-digit by 1-digit numbers	3/4	Place value counters Base 10	Short written method
Multiply 3-digit by 1-digit numbers	4	Place value counters Base 10	Short written method
Multiply 4-digit by 1-digit numbers	5	Place value counters	Short written method
Multiply 2-digit by 2-digit numbers	5	Place value counters Base 10	Long written method
Multiply 2-digit by 3-digit numbers	5	Place value counters	Long written method
Multiply 2-digit by 4-digit numbers	5 & 6	Long written method	

Skill: Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

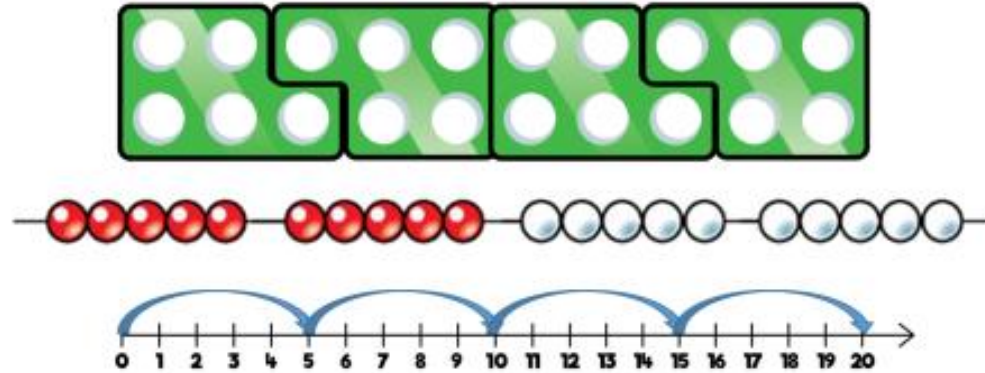
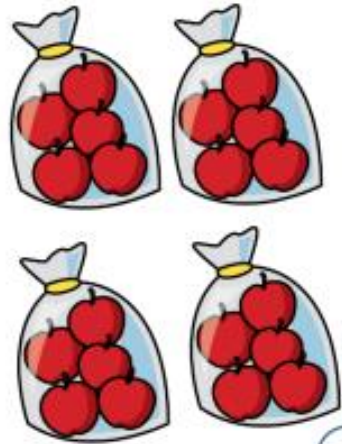
EYFS



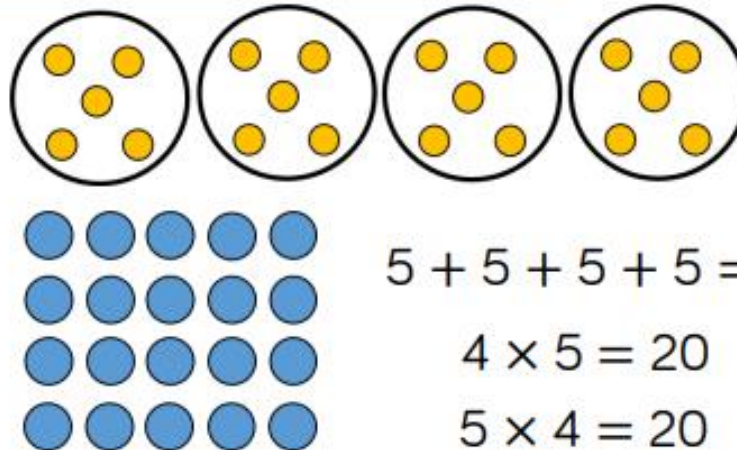
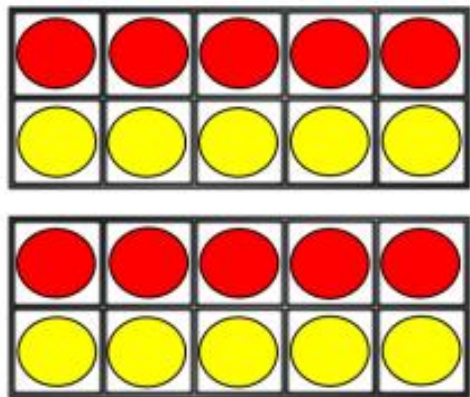
Continue to develop the children's understanding that all quantities are composed of smaller quantities.

Build in regular opportunities for the children to continue comparing and ordering quantities and measures. Prompt them to notice which set has more, which has fewer and when 2 sets have the same amount.

Continue to encourage the children to notice similarities and differences as they match and sort objects in new contexts. Ask: Can you find or build one the same as this? Can you find or build one which is different to this? Why is it different? Can you see how I have sorted these items? How else could we sort them?



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



$$5 + 5 + 5 + 5 = 20$$

$$4 \times 5 = 20$$

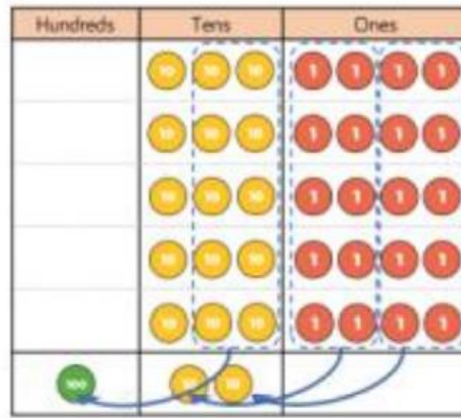
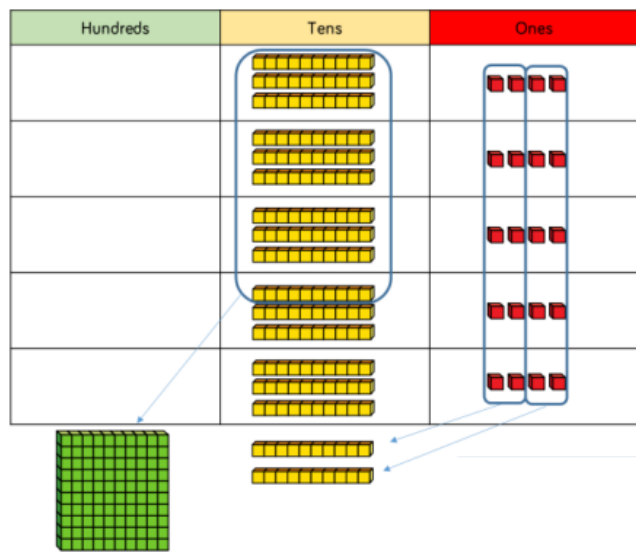
$$5 \times 4 = 20$$

Children represent multiplication as repeated addition in many different ways.

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

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

$$34 \times 5 = 170$$



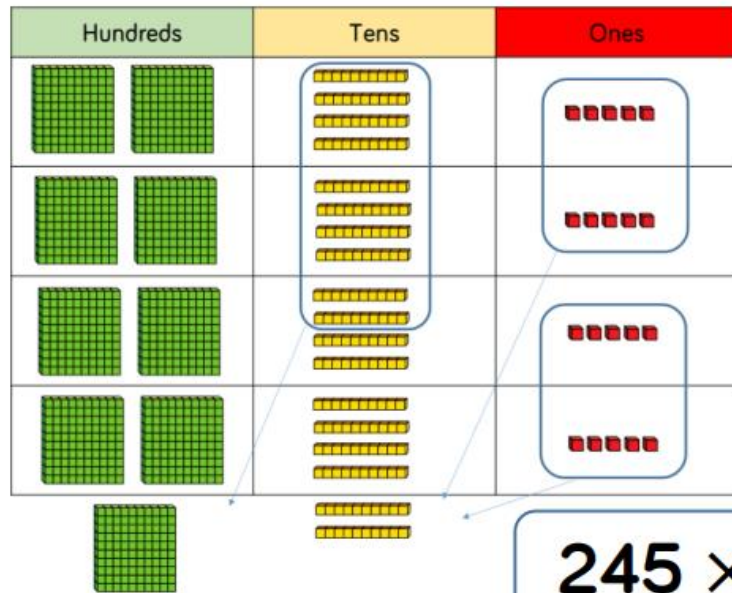
	H	T	O	
		3	4	
×			5	
	1	7	0	
	1	2		

Informal methods and visuals such as arrays, place value counters and base 10 are used before the formal short written method are introduced.

Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

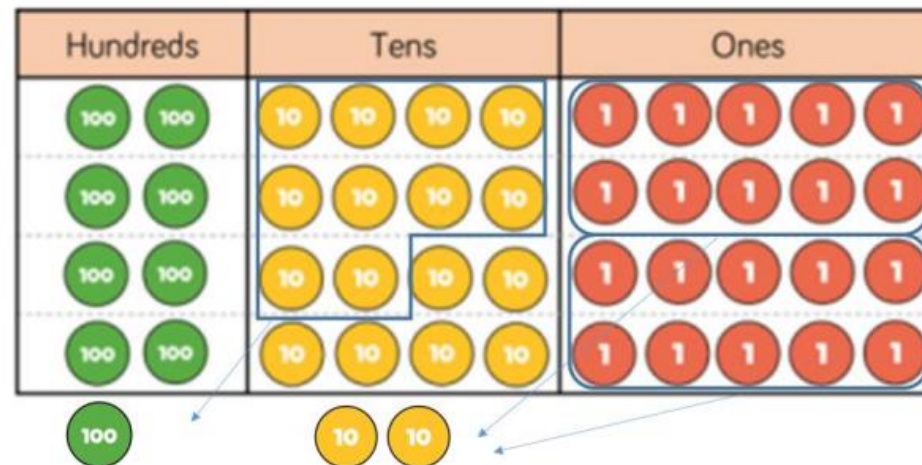
Skill: Multiply 3-digit by 1-digit numbers

Year 4



$$245 \times 4 = 980$$

	H	T	O
	2	4	5
\times			4
	9	8	0
	1	2	



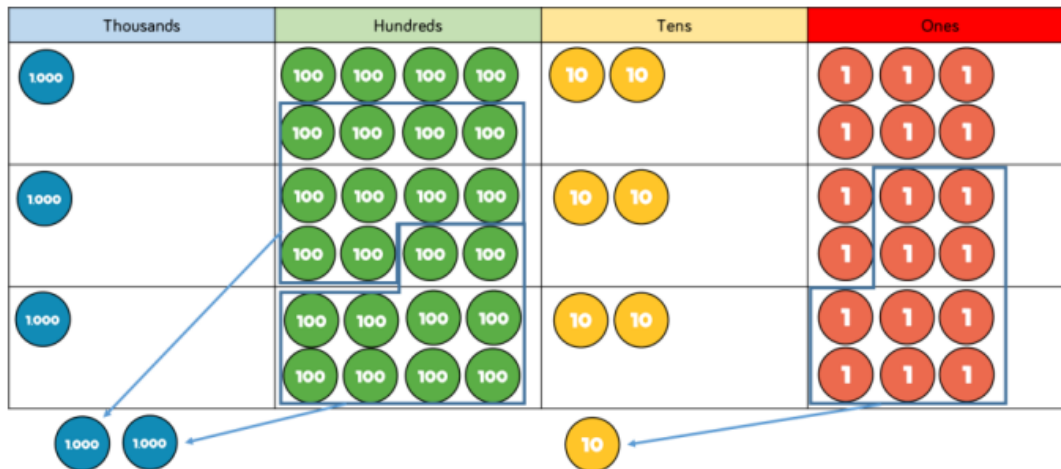
When moving to 3- digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

Base 10 and place value counters continue to support the understanding of the written method.

Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Skill: Multiply 4-digit by 1-digit numbers

Year 5



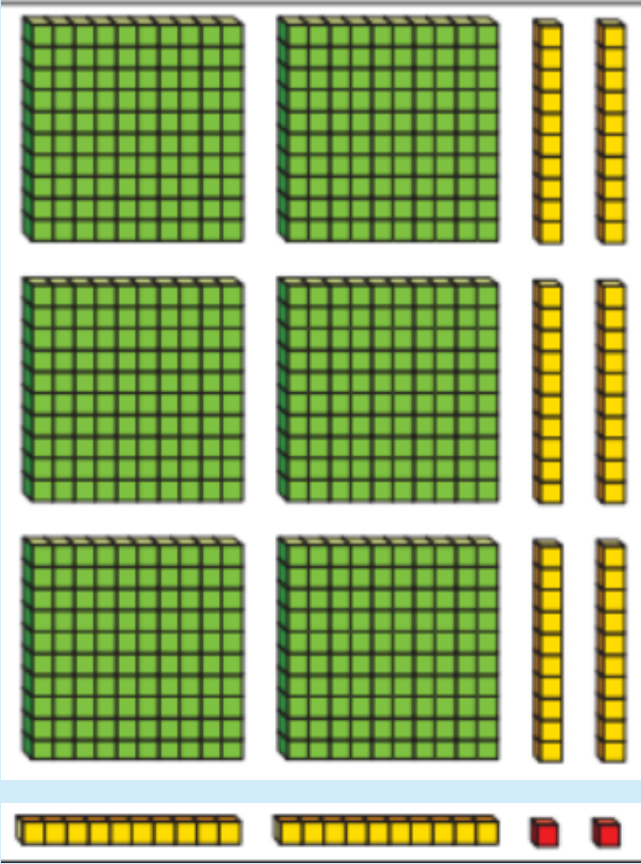
$$1,826 \times 3 = 5,478$$

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

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

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

$22 \times 31 = 682$



22×10

22×10

22×10

22×1

	H	T	O
		2	2
\times		3	1
		2	2
	6	6	0
	6	8	2

When multiplying a multi-digit number by 2-digits, use counters and place value grids to highlight the size of the numbers they are using.

Children are then first introduced to the formal written method of long multiplication.

Calculations already set out with a 0 place holder given may be used to support children at first.

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

Th	H	T	O
	2	3	4
×		3	2
<hr/>			
	4	6	8
¹ 7	¹ 0	2	0
<hr/>			
7	4	8	8

Encourage children to carry above the line when multiplying by the one

Encourage children to carry above the 2nd line when multiplying by the one

Encourage children to carry below the bottom line when completing the final addition

Children should now move towards the formal written method, seeing the links with the visuals.

Skill: Multiply 2-digit by 4-digit numbers

Year 5 & 6

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

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

Encourage children to carry above the line when multiplying by the one

Encourage children to carry above the 2nd line when multiplying by the one

Encourage children to carry below the bottom line when completing the final addition

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

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

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

Progression of Division Skills	Year	Representations & Models	
Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.	EYFS	Range of objects to count Number shapes Arrays Ten frames Bead strings Dice	Snap games Reflective art activities
Solve one-step problems with division (sharing)	Year 1 & 2	Bar model Real life objects	Arrays Counters
Solve one-step problems with division (grouping)	Year 1 & 2	Real life objects Number shapes Bead strings Ten frames	Number lines Arrays Counters
Divide 2-digits by 1-digit (sharing with no exchange)	Year 3	Straws Base 10 Bar model	Place value counters Written short division
Divide 2-digits by 1-digit (sharing with exchange)	Year 3	Straws Base 10 Bar model	Place value counters Written short division
Divide 2-digits by 1-digit (sharing with remainders)	Year 3 & 4	Straws Base 10 Bar model	Place value counters Written short division

Progression of Division Skills	Year	Representations & Models	
Divide up to 4-digits by 1-digit (grouping, writing remainders as fractions or decimals)	Year 4 & 5	Place value counters Counters Place value grid	Written short division
Divide multi-digits by 2-digits (short method)	Year 6	List of multiples Written short division	

Skill: Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

EYFS

Sharing and Grouping

Snack



Encourage the children to sit with their friends in small groups for snack or have a picnic outside. Provide quantities of food that can be shared onto their plates. For example a box of raisins, a handful of crackers, some sticks of carrot or slices of banana.

Small World



Ask the children to make groups using the small world animals.
Can they make groups of 2?
What happens if they make groups of 3?
Can they make more groups of 2 or more groups of 3?

Enhancements to areas of learning

Funky Fingers

Provide some threading beads or coloured pasta and encourage the children to thread the items in groups to create a necklace.

Do all of the necklaces have equal groups?

Compare the necklaces.

What's the same? What's different?



Teddy Bear Picnic



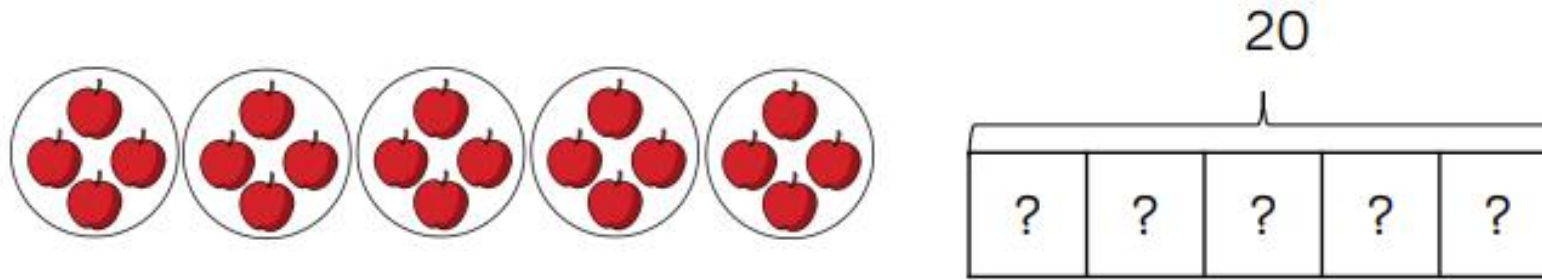
Provide teddy bears, plates and small quantities of loose parts for representing different food items. Ask the children to share out the loose parts fairly so that each teddy gets the same. Are there any items left over? What will happen if another teddy joins the picnic?

The children should also be given opportunities to recognise and make equal groups. For example can you put 3 crackers on each plate or plant 2 flowers into each pot. What groups do they notice on a bead string? The children will notice that sometimes there are items left over when they share or group. Encourage them to come up with their own suggestions for how to resolve this.

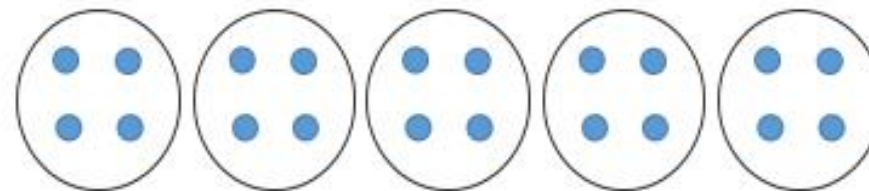
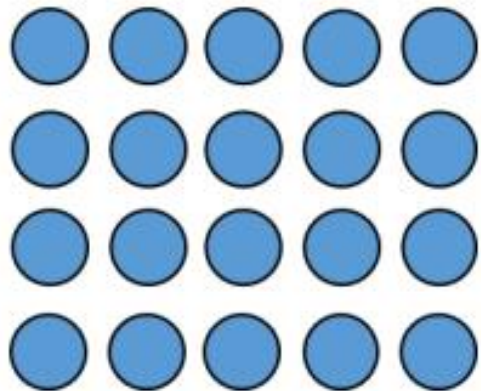
Provide opportunities for children to group objects in different contexts. Can they give each gingerbread man 3 buttons? Can they give each child 5 carrot sticks during snack. Can they arrange their pebbles into groups of 2? What about groups of 3?

Skill: Solve one-step problems with division (sharing)

Year 1 & 2



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

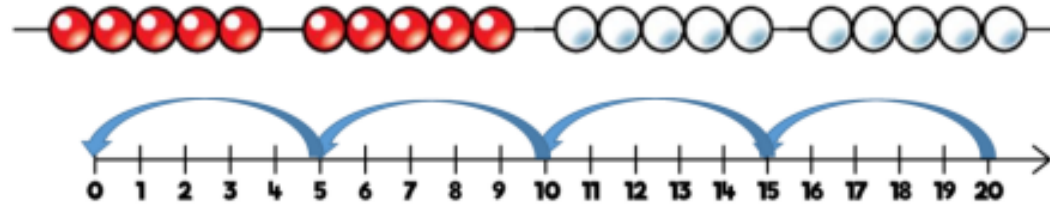
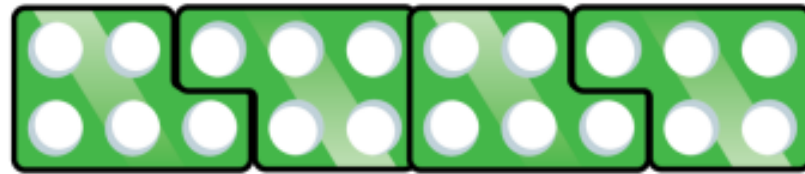
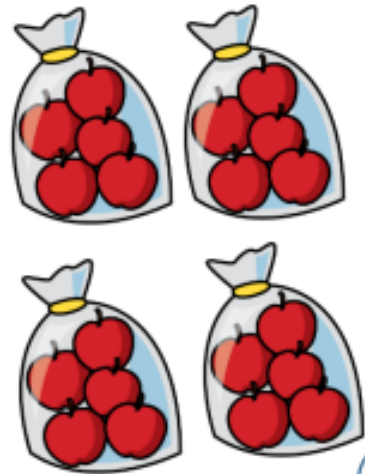


$$20 \div 5 = 4$$

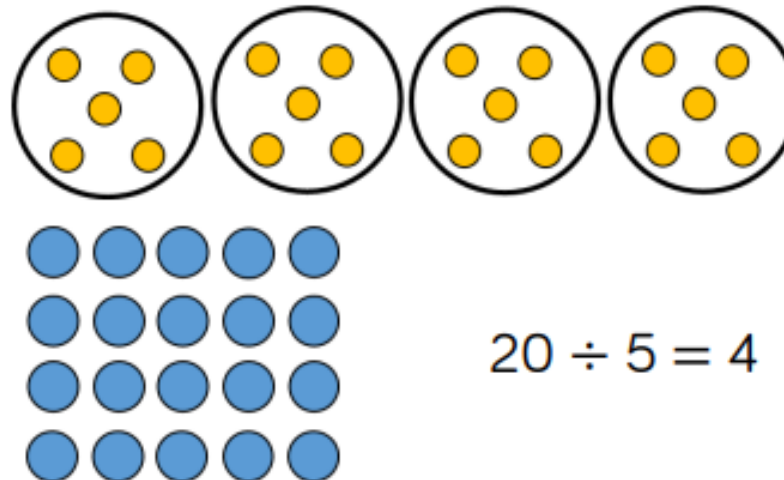
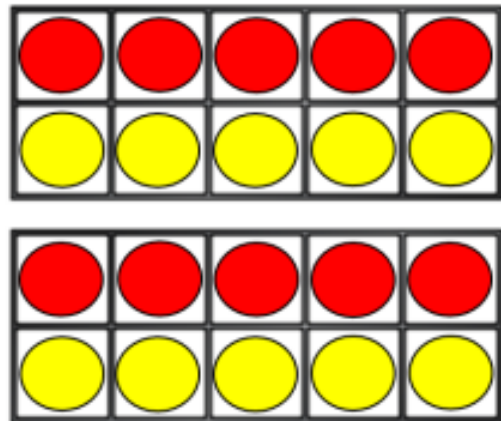
Children solve problems by sharing amounts into equal groups.

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

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



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



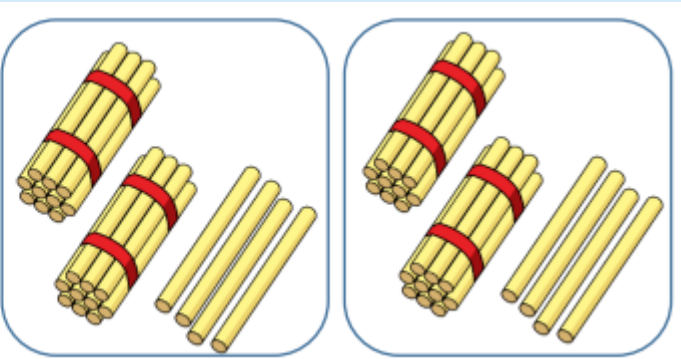
$$20 \div 5 = 4$$

Children solve problems by grouping and counting the number of groups.

Grouping encourages children to count in multiples and links to repeated subtraction on a number line.

They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division

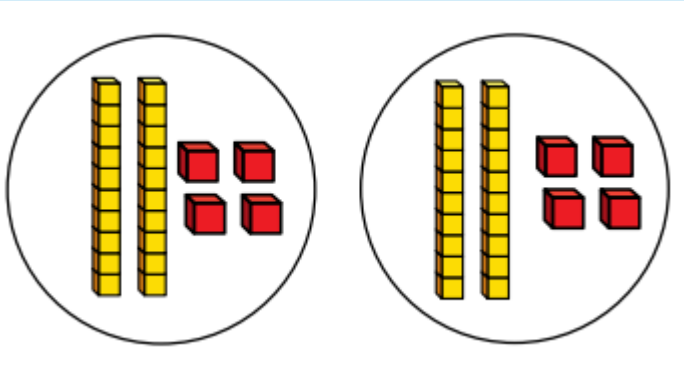
Tens	Ones
10 10	1 1 1 1
10 10	1 1 1 1



48 ÷ 2 = 24

	2	4	
2	4	8	

48	
24	24



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

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

Children are first introduced to the ‘bus stop’ short division written method.

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

Year 3



Tens	Ones

52

?	?	?	?
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$$52 \div 4 = 13$$

Tens	Ones

	1	3	
4	5	2	

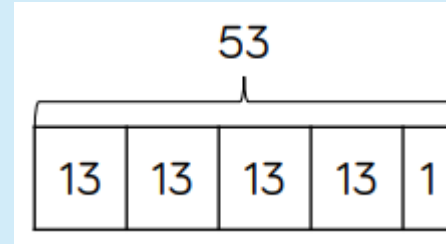
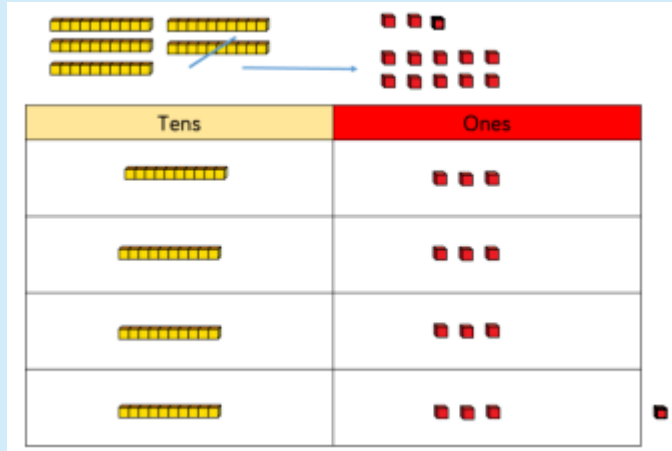
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.

Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

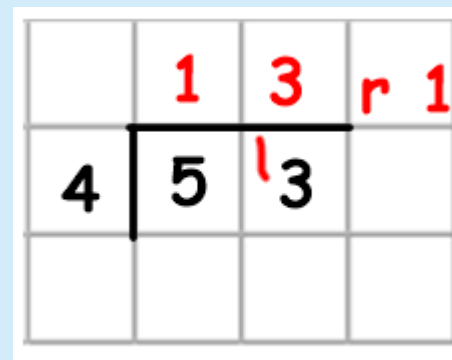
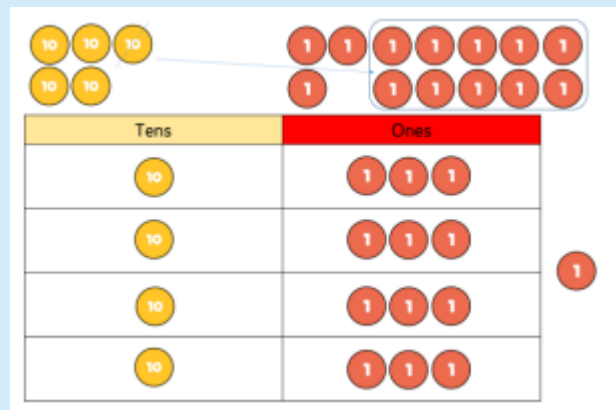
Children are then shown how to complete this exchange using short division.

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

Year 3 & 4



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



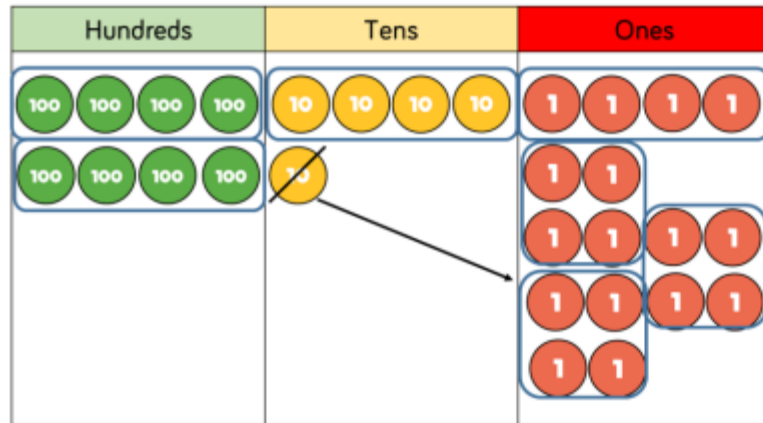
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.

Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.

Children are shown how to complete this using short division and how to record any remainders.

Skill: Divide up to 4-digits by 1-digit (grouping, writing remainders as fractions or decimals)

Year 4 & 5



		2	1	4
	4	8	5	¹ 6

	4	2	6	6
2	8	5	¹ 3	¹ 2

	2	6	1	r 1
2	5	¹ 2	3	

$$523 \div 2 = 261 \frac{1}{2}$$

Year 5 children will be shown how to write remainders and fractions and decimals and consider remainders in content.

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

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

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

$432 \div 12 = 36$

		0	3	6
	12	4	⁴ 3	⁷ 2

$7,335 \div 15 = 489$

	0	4	8	9
15	7	⁷ 3	¹³ 3	¹³ 5

15
30
45
60
75

When children begin to divide up to 4- digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective.

Children can write out multiples to support their calculations with larger remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate

Glossary

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

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

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

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

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

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

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

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

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