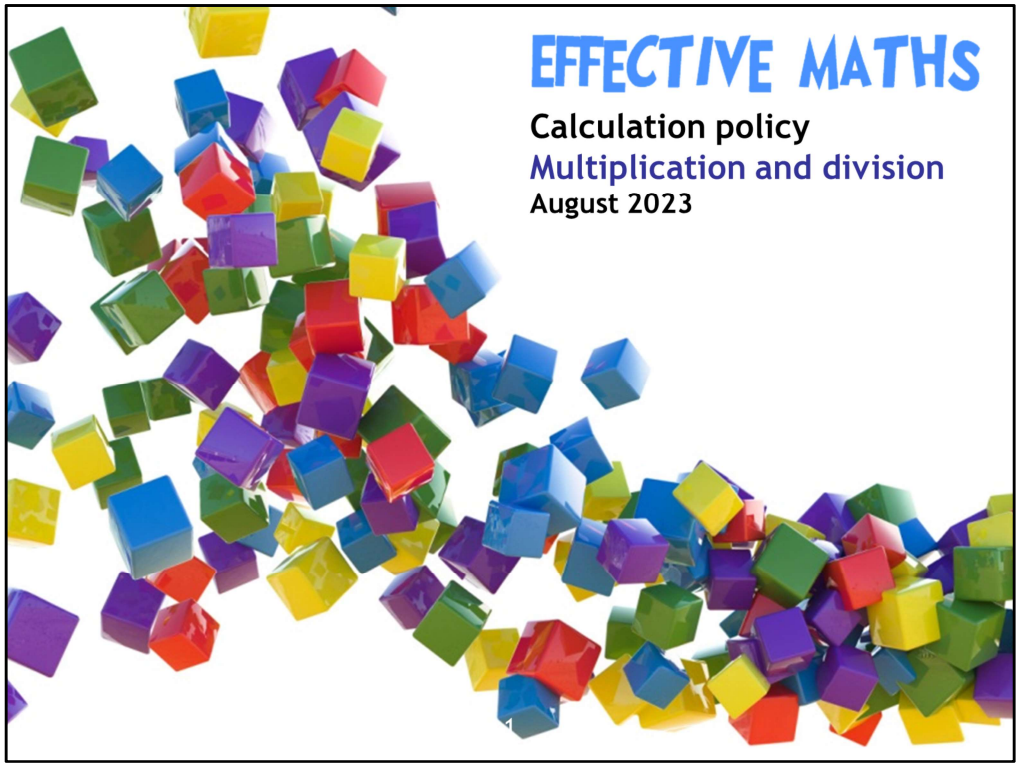

EFFECTIVE MATHS
Calculation policy
Multiplication and division
August 2023

This document provides an overview of the content and methods encountered in each year group from Year 1 to Year 6.

For each year group in Years 1-6 the document provides:
i. a content summary section;
ii. details about the approaches used for teaching the above;
iii. the representations used.

Each section includes content from:
- calculation unit 6 (Y1); multiplication and division units 1 and 2 (Y2); multiplication and division units 1 to 3 (KS2);
- the Block 3 calculation unit;
- money and decimals units;
- fractions units (Years 2-6).

The document is provided in several versions:
- whole school version (this document);
- year group specific versions;
- a Key Stage 1 only version (for infant schools).

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 1

Year 1			
	Block 1	Block 2	Block 3
Calculation content			CALCULATION (UNIT 6) • Identifying groups • Equal groups • Repeated addition • Making equal rows (arrays) • Doubles • Multiplication stories • Equal groups (division) • Equal sharing

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods			Children begin their work on multiplication with an understanding that a unit does not have to be one. In place value units and fluency sessions they have counted in twos, fives and tens. This provides some support with understanding the concept of multiplication. <u>Identifying groups</u> Initial learning about groups focuses on deepening understanding about what the term 'group' means. They identify whether a collection of objects can/cannot form a group. <u>Equal groups</u> Children learn to identify objects grouped into equal or unequal groups. Where the groups are not equal, they are encouraged to think about how to rearrange the objects to make equal groups. At this stage the focus is on the structures: number of groups and number in each group. The focus is *not* on the total amount.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods			Repeated addition The next step involves describing equal groups using repeated addition. Children use repeated addition expressions to describe equal group situations. An expression is different from an equation as there is no equals sign. Children devise repeated addition expressions such as 3 + 3 + 3. At this stage they do not need to give the total amount. So they do not need to say things like 3 + 3 + 3 = 9. They also describe the groups, starting with the number of groups, then giving the group size. For example: *There are three groups. There are three dolls in each group.*

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods			Making equal rows (arrays) Children's learning about groups becomes more structured as they make equal rows. This means that they are building arrays. An array is a powerful structure to provide conceptual understanding for multiplication and, later, division. They describe the number of items in each row, the number of columns, and then the total. After this, children use counters to build arrays. They describe the arrays in two ways: • the number of rows followed by the number of counters in each row; • the number of columns followed by the number of counters in each column. Doubles Doubling has been encountered previously. Teaching now emphasises that 'double' is two groups of a number or an amount. Children's knowledge of doubles is extended from doubles of 1-5 to doubles of 1-10.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

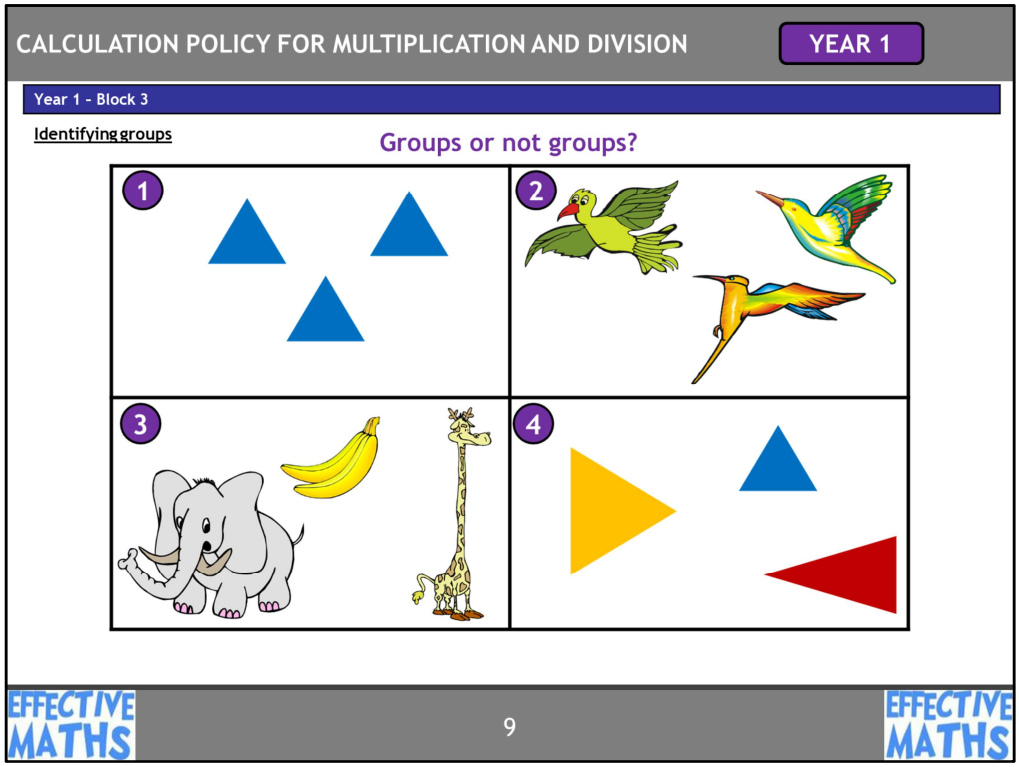
YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods			Multiplication stories Year 1 work on multiplication concludes by consolidating children's understanding about ways to describe equal groups. They do this by stating the number of groups, then the number in each group. They also use repeated addition. For example: *There are 2 trees with apples on.* *There are 5 apples on each tree.* *5 + 5 = 10.* Equal groups (division) Children's understanding about equal groups is now applied to learning about division. They take an amount and divide it into equal groups. Division as grouping is also known as quotitive division. The language used is important. We are not saying 12 'divided by' 3. We are saying '12 put into groups of 3 makes 4 groups'. In division as grouping the quotient (the answer) is the number of equal groups.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

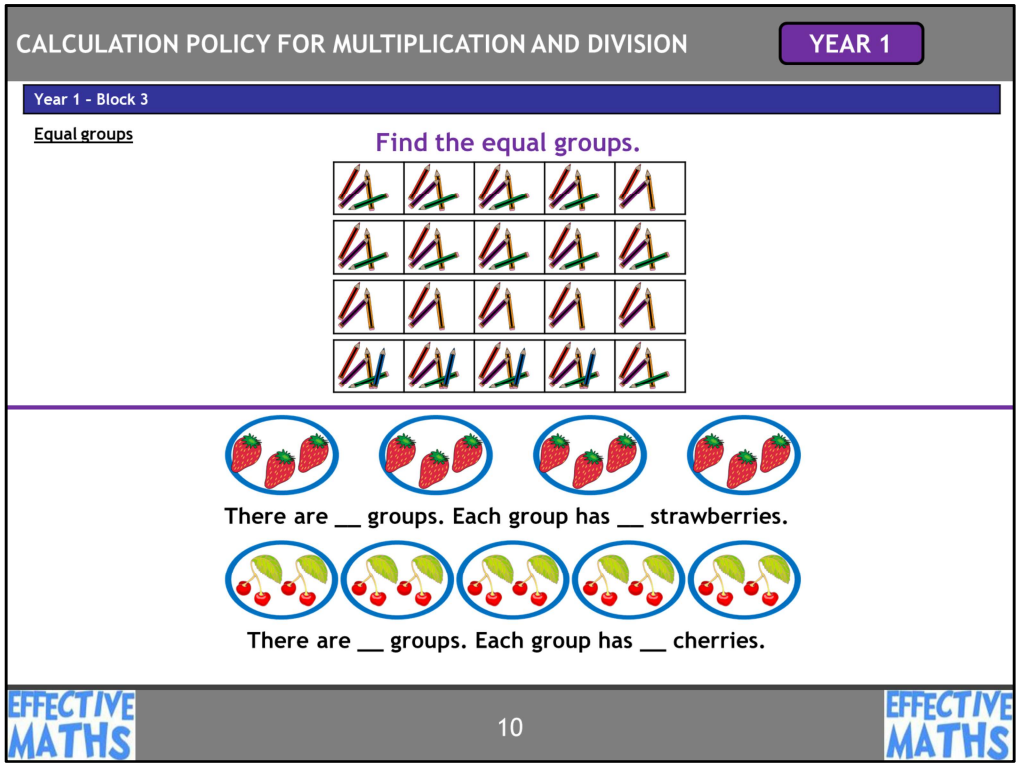
YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods			<u>Equal sharing</u> Finally, the division structure of sharing is introduced. (This is also known as partitive division.) Here, the total amount is split between a number of people/objects etc. Using the language of grouping is avoided as it is not appropriate for sharing contexts. In division as sharing the quotient (the answer) is the number of items each person has.



BLOCK 3
CALCULATION UNIT 6

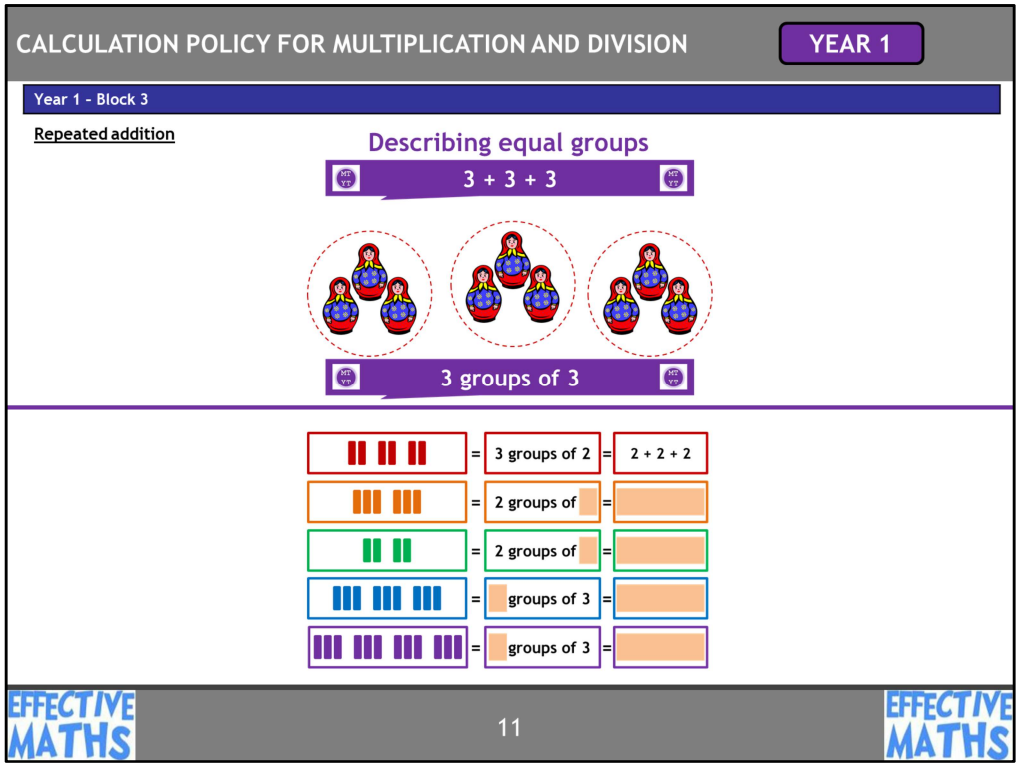
Identifying groups
Initial learning about groups focuses on deepening understanding about what the term 'group' means.
They identify whether a collection of objects can/cannot form a group.



Equal groups

Children learn to identify objects grouped into equal or unequal groups. Where the groups are not equal, they are encouraged to think about how to rearrange the objects to make equal groups.

At this stage the focus is on the structures: number of groups and number in each group. The focus is *not* on the total amount; we do not say things like, 'There are twelve strawberries altogether'.



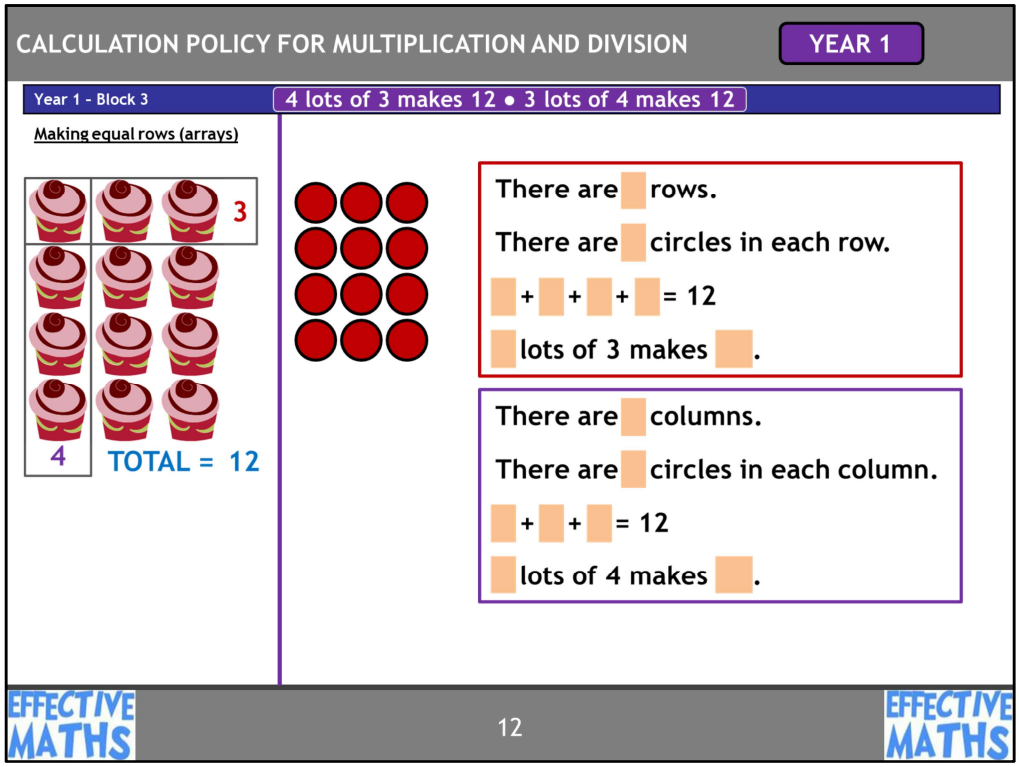
Repeated addition

The next step involves describing equal groups using repeated addition. Children use repeated addition expressions to describe equal group situations. An expression is different from an equation as there is no equals sign.

Children devise repeated addition expressions such as 3 + 3 + 3. At this stage they do not need to give the total amount. So they do not need to say things like 3 + 3 + 3 = 9.

They also describe the groups, starting with the number of groups, then giving the group size. For example:

There are three groups. There are three dolls in each group.



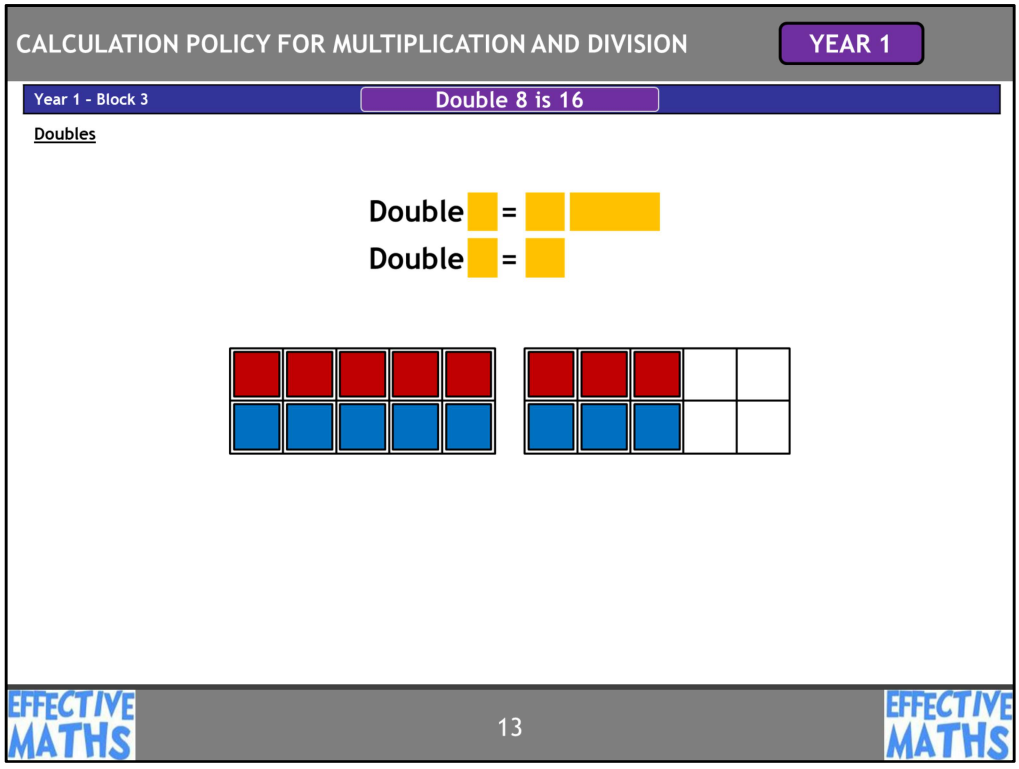
Making equal rows (arrays)

Children's learning about groups becomes more structured as they make equal rows. This means that they are building arrays. An array is a powerful structure to provide conceptual understanding for multiplication and, later, division. They describe the number of items in each row, the number of columns, and then the total.

After this, children use counters to build arrays. They describe the arrays in two ways:

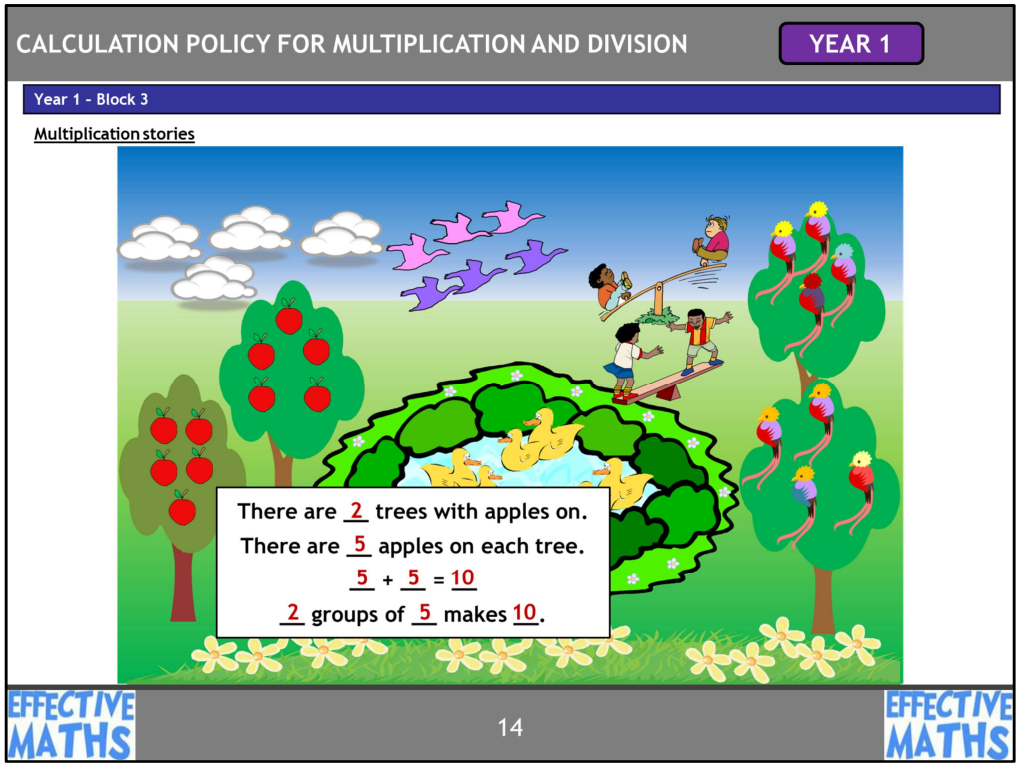
the number of rows followed by the number of counters in each row;

the number of columns followed by the number of counters in each column.



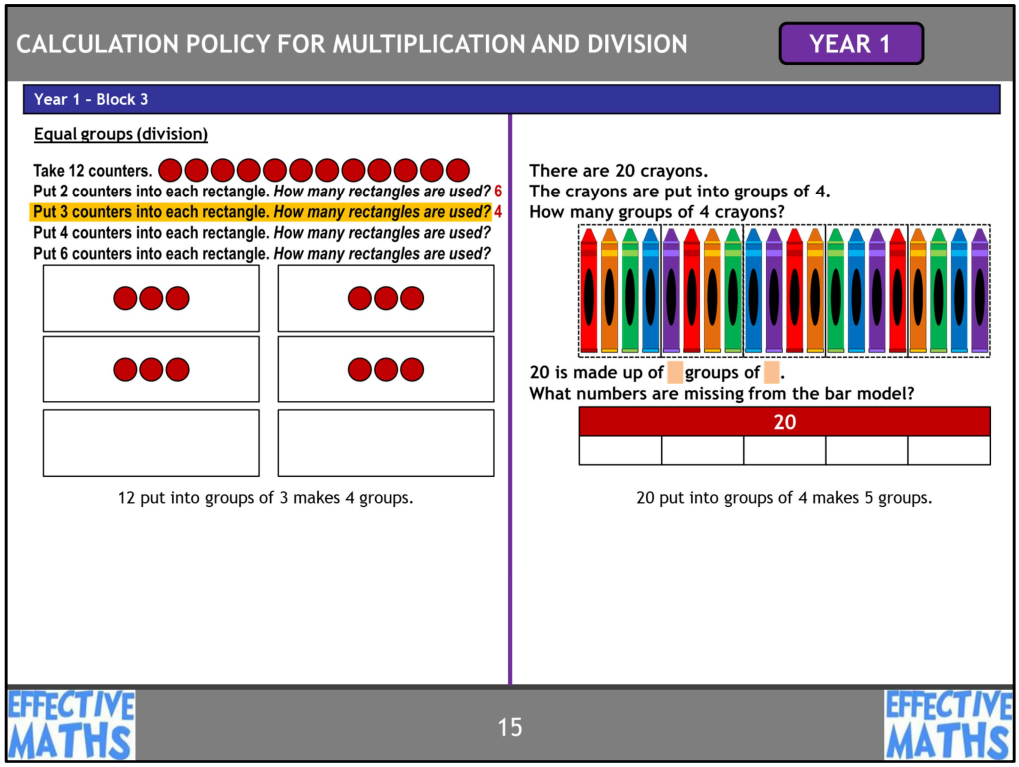
Doubles

Doubling has been encountered previously. Teaching now emphasises that 'double' is two groups of a number or an amount. Children's knowledge of doubles is extended from doubles of 1-5 to doubles of 1-10.



Multiplication stories

Year 1 work on multiplication concludes by consolidating children's understanding about ways to describe equal groups. They do this by stating the number of groups, then the number in each group. They also use repeated addition. For example:
There are 2 trees with apples on.
There are 5 apples on each tree.
5 + 5 = 10.



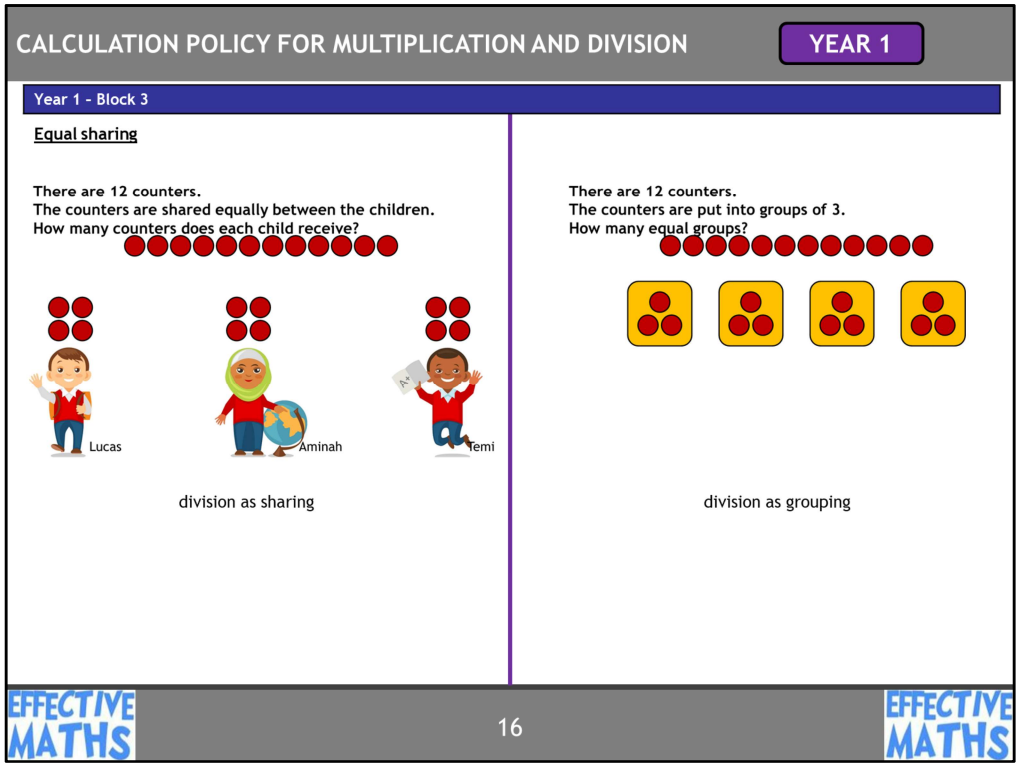
Equal groups (division)

Children's understanding about equal groups is now applied to learning about division. They take an amount and divide it into equal groups.

Division as grouping is also known as quotitive division.

The language used is important. We are not saying 12 'divided by' 3. We are saying '12 put into groups of 3 makes 4 groups'.

In division as grouping the quotient (the answer) is the number of equal groups.



Equal sharing

Finally, the division structure of sharing is introduced. (This is also known as partitive division.) Here, the total amount is split between a number of people/objects etc. Using the language of grouping is avoided as it is not appropriate for sharing contexts.

In division as sharing the quotient (the answer) is the number of items each person has.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Calculation content	MULTIPLICATION AND DIVISION (UNIT 1) • Groups and equal groups • 5 × table • 10 × table • 2 × table • Division: sharing by 2 • Division: making groups of 2 • Odd and even numbers • Dividing by 5 • Dividing by 10 FRACTIONS (UNIT 1) • Finding half	MONEY AND DECIMALS (UNIT 1) n/a MULTIPLICATION AND DIVISION (UNIT 2) • 10 × table (r) • Dividing by 10 (r) • 5 × table (r) • Dividing by 5 (r) • 2 × table (r) • Dividing by 2 (r) FRACTIONS (UNIT 2) • Finding half (r) • Finding one quarter • Finding quarters • Finding thirds	CALCULATION UNIT • Doubling and halving MONEY AND DECIMALS (UNIT 2) • Multiplying amounts of money • Dividing amounts of money

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Groups and equal groups In Y1 children learnt about equal and unequal groups. They began to understand the equivalence between a repeated addition expression and a multiplication expression exists due to equal groups, eg: 10 + 10 + 10 = 3 × 10 Teaching shows how the numbers in '3 × 10' relate to the numbers in '10 + 10 + 10'. 5 × table Children's knowledge about multiplication is developed by learning about the 5 × table. The array is introduced as a key tool for conceptual understanding. Pictures are used as prompts for writing multiplication equations, eg: 4 × 5 = 20. Teaching encourages children to explain how each term links to the context.	10 × table (r) and dividing by 10 (r) Block 2 begins with revision of the 10 × table and the related division facts. There are no new representations. Children continue to work with arrays, including arrays that support early understanding of the distributive property of multiplication. There is an emphasis on strengthening connections between multiplication and division and this is echoed in fluency sessions.	Doubling and halving Understanding of doubling and halving is extended to finding double/half of two-digit numbers beyond 20. The strategy modelled is to partition the two-digit number into tens and ones, find half of each part, and then combine. Children need to know half of multiples of 10 to 90 and half of the even numbers 2, 4, 6 and 8. Multiplying amounts of money Children's knowledge of multiplication facts is applied to the context of money. Visual representations emphasise the repeated addition structure of multiplication. Children find missing amounts on a money multiplication grid and develop the ability to represent problems with bar models.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	10 × table Learning about the 10 × table continues to make use of arrays and the interpretation of pictorial representations. Links between the 5 × table and 10 × table are also explored. 2 × table Learning about the 2 × table also continues to make use of arrays. An early introduction to the distributive property of multiplication (not referred to as such) deepens understanding about multiplication. For example: 3 × 2 = 6 2 × 2 = 4 5 × 2 = 10	5 × table (r) and dividing by 5 (r) As with the 10 × table, there are no new representations. Again, there is an emphasis on strengthening connections between multiplication and division and this is echoed in fluency sessions. Throughout Block 2 there is a focus on applying knowledge of multiplication and division to solve problems.	Dividing amounts of money The money multiplication grid is used for division. Teaching makes explicit links with multiplication. 3 × __ = 6p 6p ÷ 3 = 2p Children continue to develop the ability to represent problems with bar models.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Division: sharing by 2 Learning about division begins by understanding that the term divide can be used when something is separated into equal parts. Learning to divide by 2 begins with the partitive (sharing) division structure. Children are introduced to the division symbol: ÷. Connections are made between division and multiplication, supported by the relationship triangle, eg: 10 ÷ 2 = 5 5 × 2 = 10 Division: making groups of 2 The quotitive division structure is introduced next and children learn to make equal groups. Links between multiplication and division continue to be supported by the relationship triangle.	2 × table (r) Learning about the 2 × table does introduce a new representation: the multiplication grid. The core purpose of the lesson is to familiarise children with how the grid works as it is likely something they will encounter. Teaching introduces the commutative property and shows how we obtain the same product regardless of the order of the factors. The multiplication grid may look a bit like a 100 square, but it works in a very different way. The multiplication grid is actually arrays. The first grid shows 7 rows of 2. The second shows 2 columns of 7.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

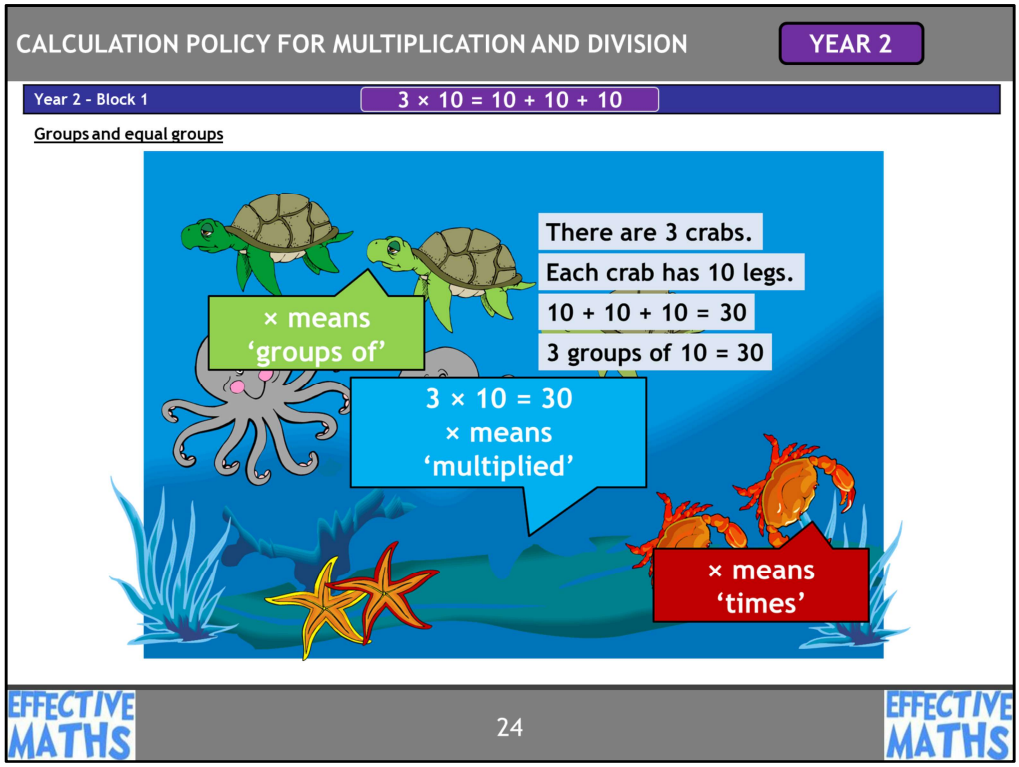
Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Odd and even numbers</u> Learning explores dividing by 2 using the context of odd and even numbers and children learn that even numbers can be divided exactly by 2. <u>Dividing by 5</u> Learning to divide by 5 involves both sharing and grouping structures. Teaching seeks to help children to see where the quotient is in each structure: for sharing - the number in each group; for grouping - the number of groups. The relationship triangle is used to help make links between multiplication and division. <u>Dividing by 10</u> Block 1 concludes with learning to divide by 10, using both sharing and grouping structures.	<u>Dividing by 2</u> Solving problems involving dividing by 2 introduces the concept of inverse. Children will need to learn the term, but understanding of it is best achieved by talking about *working forwards* or *working backwards*. In the case of 7 × 2 = __ we are working forwards. In the case of 14 = __ × 2 we are working backwards or using the inverse. In the examples shown in the representations section, we can solve row 1 and row 2 by working forwards. To solve row 3 we need to work backwards.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Finding half Learning to find half of a number, a group of objects or a shape begins by revisiting the connections between the 2 × table and its related division facts. The focus is on finding half of numbers to 20. Children engage in a range of contexts that involve finding half of even numbers to 20.	Finding half (r) Revision of finding half of numbers to 20 continues to make connections between the 2 × table and its related division facts. Activities include shading shapes to show one-half and also drawing lines on grids to divide shapes into halves. Finding one quarter Children learn that one quarter of a set of objects occurs when the whole is split into 4 equal parts. Note that the 4 × table has not been taught in Year 2 - it is taught in Year 3 - so children cannot use their knowledge of division facts to obtain one quarter. A range of approaches are used, including using concrete resources, encouraging the use of drawing and linking to knowledge of finding half.	

Year 2			
	Block 1	Block 2	Block 3
Strategies/ methods		<u>Finding three-quarters</u> Finding three-quarters of a set is initially done through using concrete resources. Connections are also made to finding one quarter: if one quarter is 5, then two-quarters is 10 and three-quarters is 15. <u>Finding thirds</u> Children learn that one third of a set of objects occurs when the whole is split into 3 equal parts. Note that the 3 × table has not been taught in Year 2 - it is taught in Year 3 - so children cannot use their knowledge of division facts to obtain one third. Nor can they make links to other maths facts they know. They have had experience of counting in threes and the use of concrete resources, visual representations and drawing are the prime strategies for finding thirds. As for learning to find three-quarters, children apply their knowledge of finding one-third to finding two-thirds.	



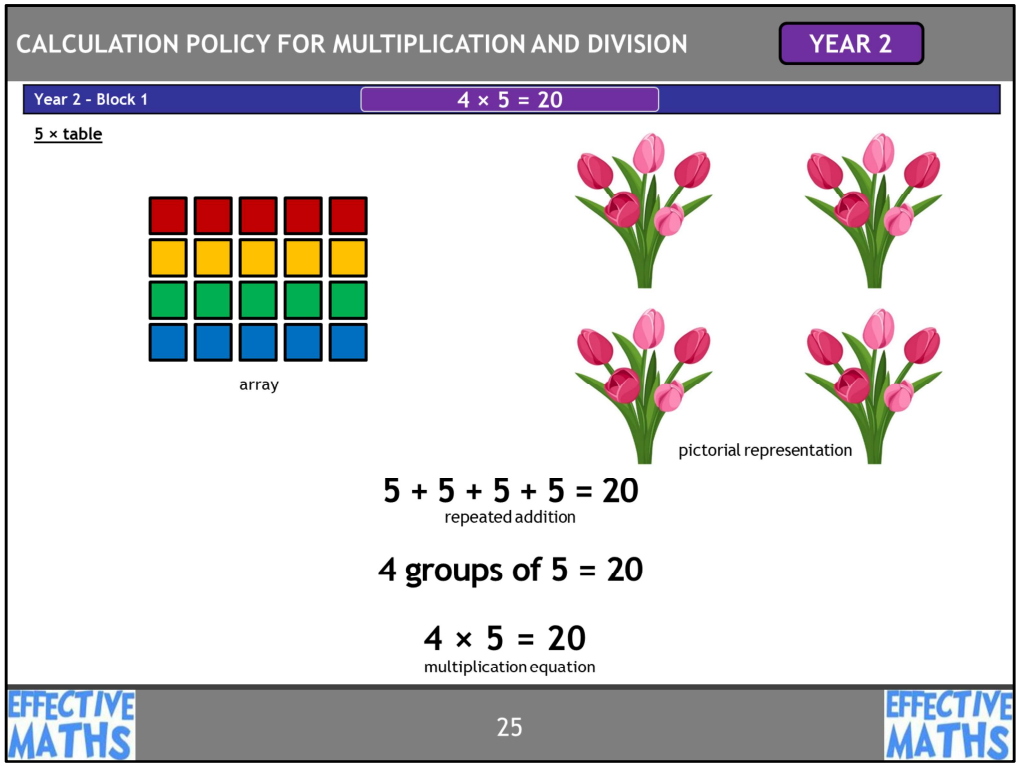
BLOCK 1
× and ÷ UNIT 1

Groups and equal groups

In Y1 children learnt about equal and unequal groups. They began to understand the equivalence between a repeated addition expression and a multiplication expression exists due to equal groups, eg:

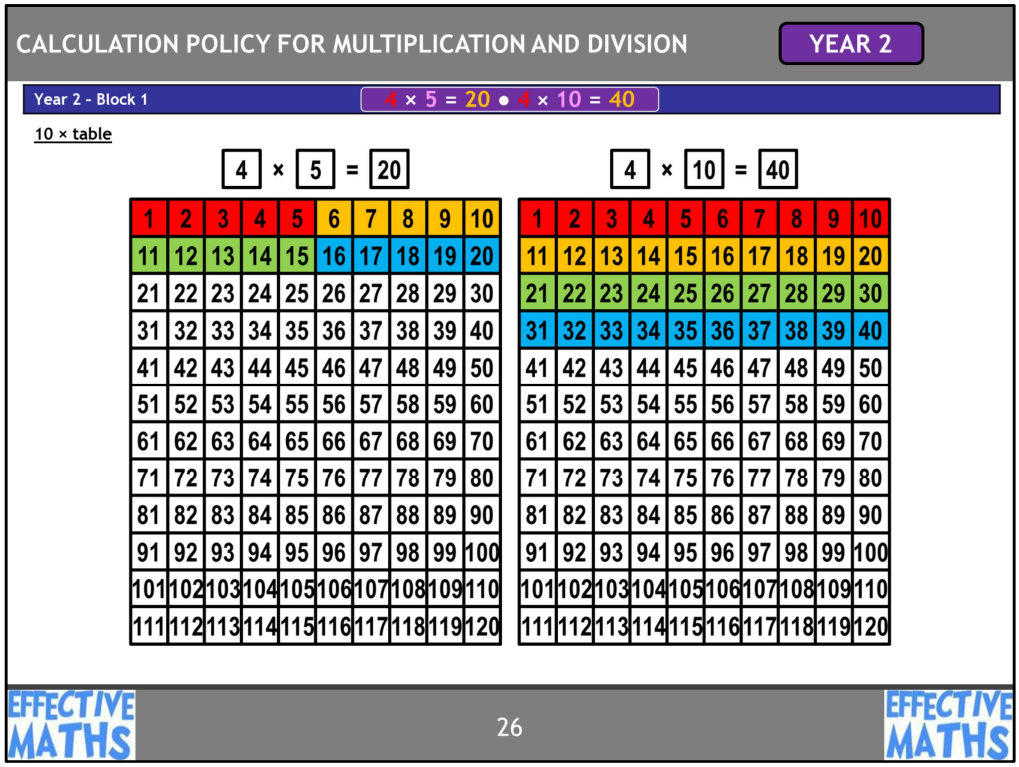
10 + 10 + 10 = 3 × 10

Teaching shows how the numbers in '3 × 10' relate to the numbers in '10 + 10 + 10'.



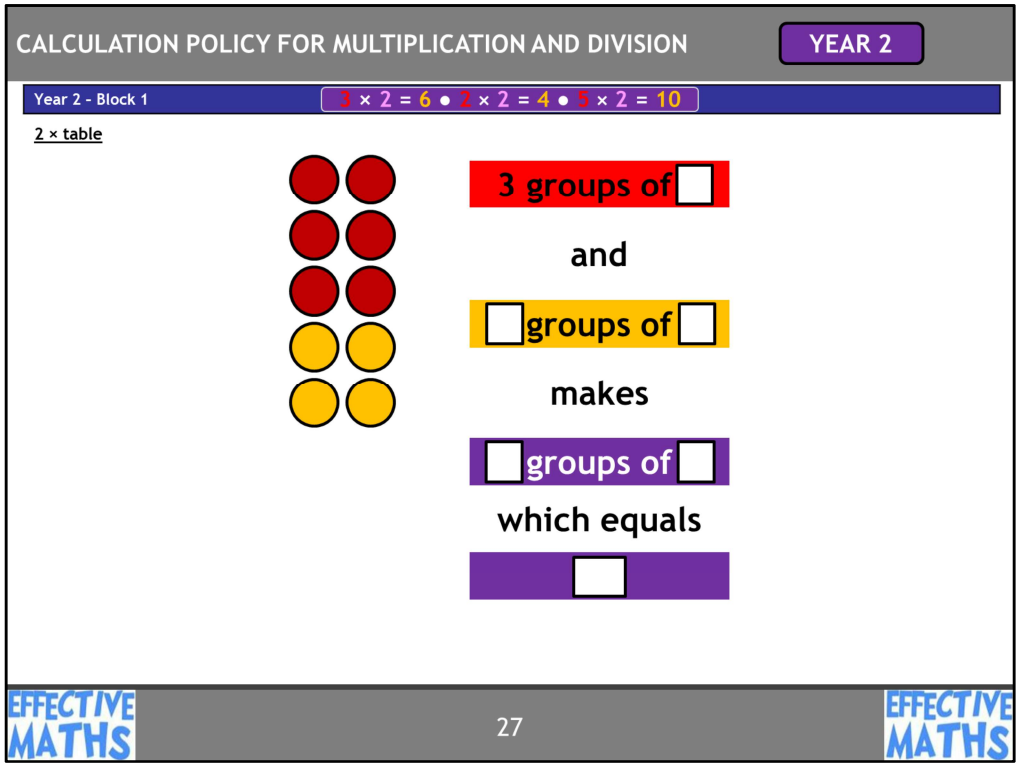
5 × table

Children's knowledge about multiplication is developed by learning about the 5 × table. The array is introduced as a key tool for conceptual understanding. Pictures are used as prompts for writing multiplication equations, eg:
4 × 5 = 20.
Teaching encourages children to explain how each term links to the context.



10 × table

Learning about the 10 × table continues to make use of arrays and the interpretation of pictorial representations. Links between the 5 × table and 10 × table are also explored.



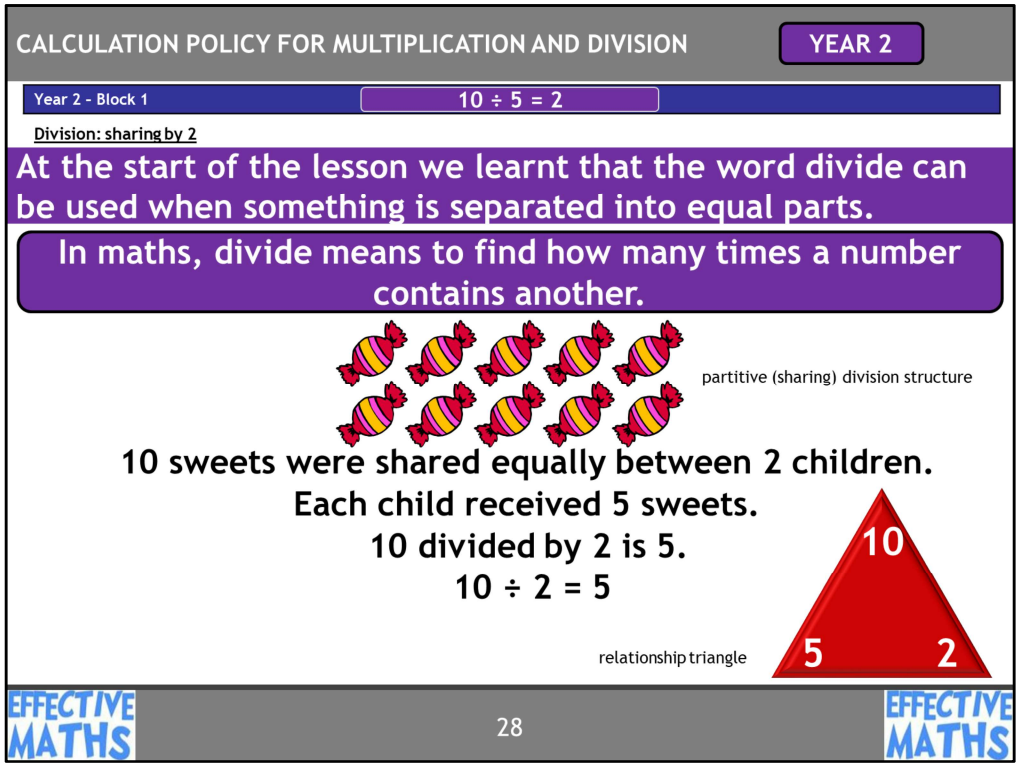
2 × table

Learning about the 2 × table also continues to make use of arrays. An early introduction to the distributive property of multiplication (not referred to as such) deepens understanding about multiplication. For example:

3 × 2 = 6

2 × 2 = 4

5 × 2 = 10

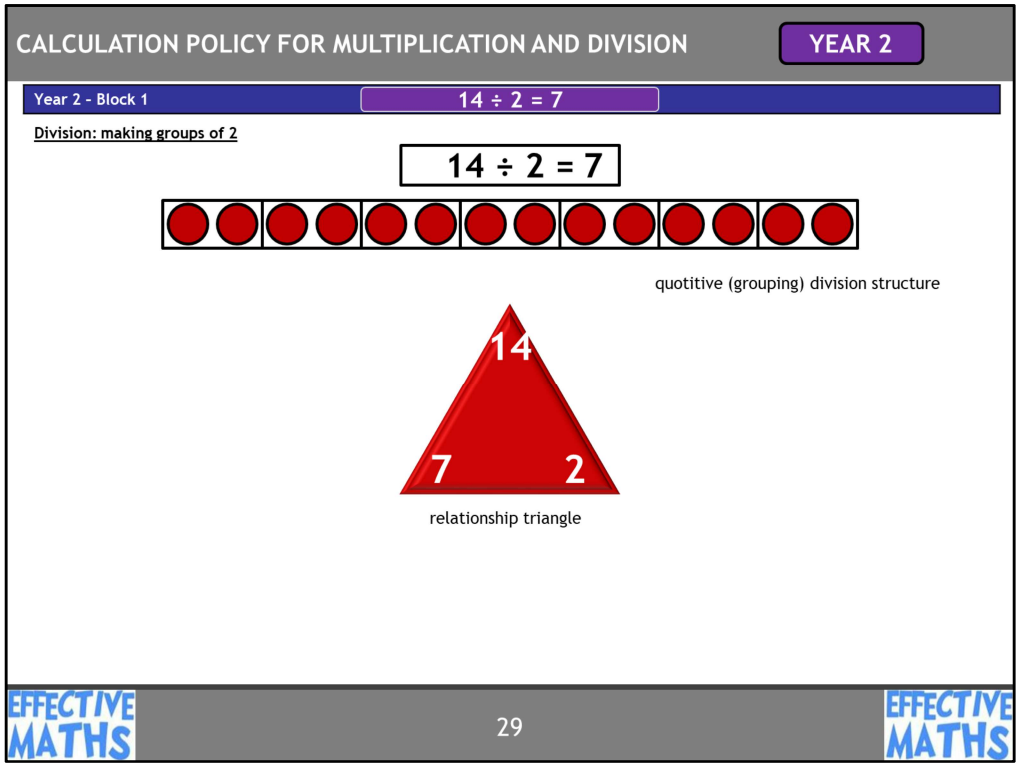


Division: sharing by 2

Learning about division begins by understanding that the term divide can be used when something is separated into equal parts. Learning to divide by 2 begins with the partitive (sharing) division structure. Children are introduced to the division symbol: ÷. Connections are made between division and multiplication, supported by the relationship triangle, eg:

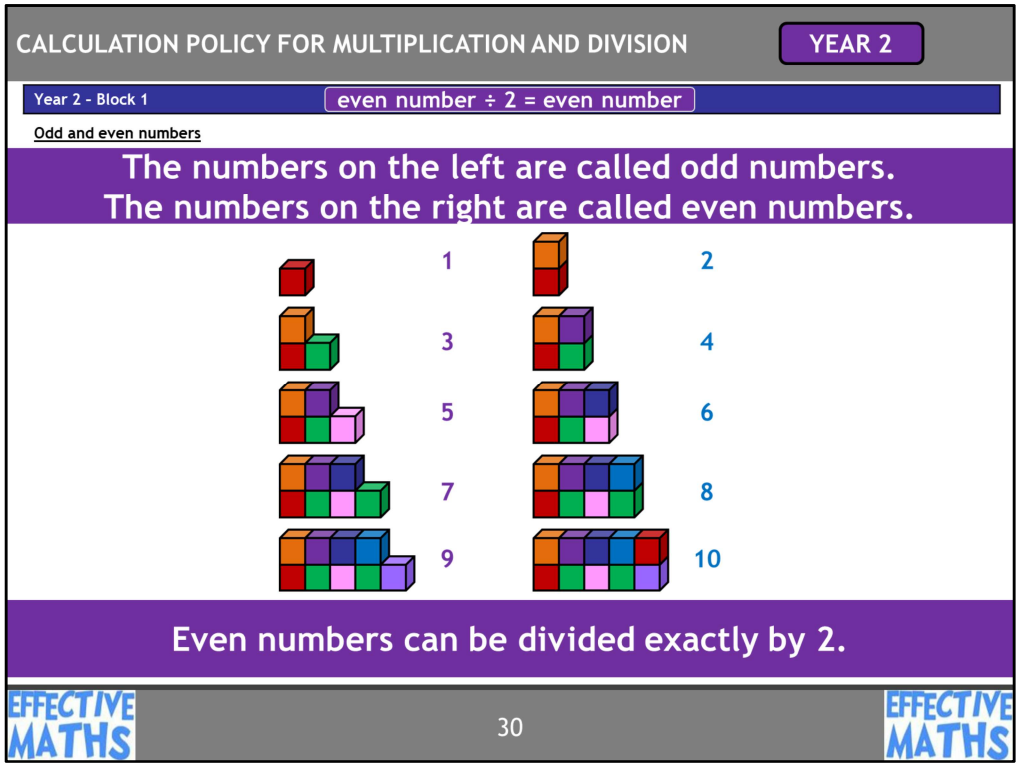
10 ÷ 2 = 5

5 × 2 = 10



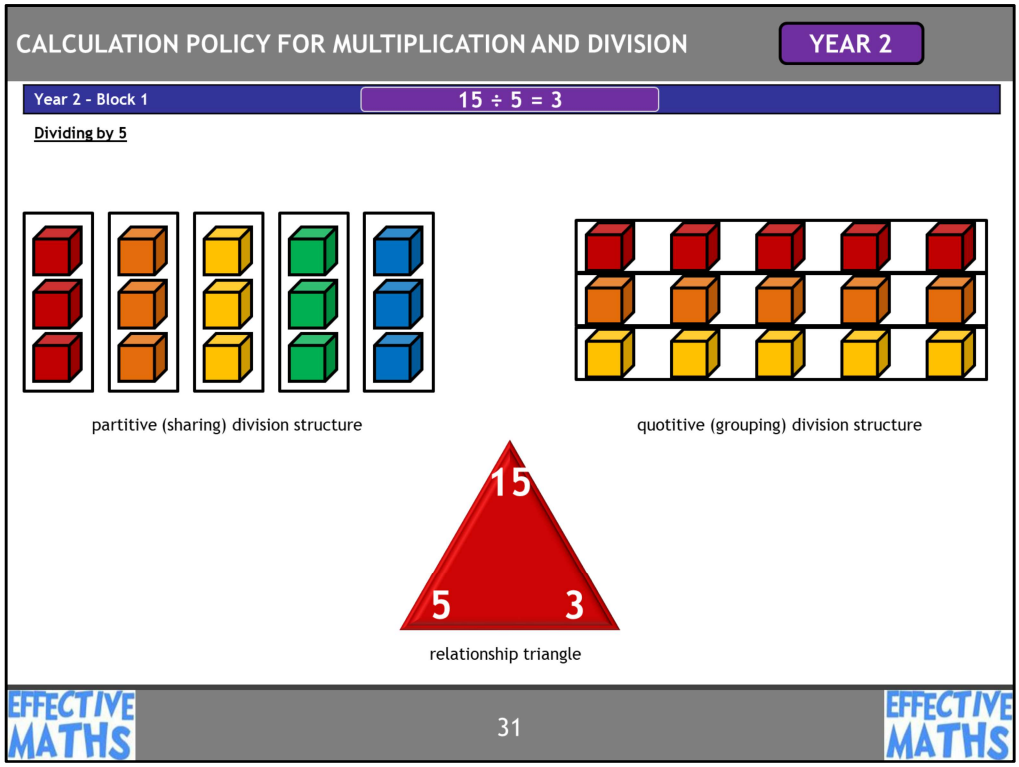
Division: making groups of 2

The quotitive division structure is introduced next and children learn to make equal groups. Links between multiplication and division continue to be supported by the relationship triangle.



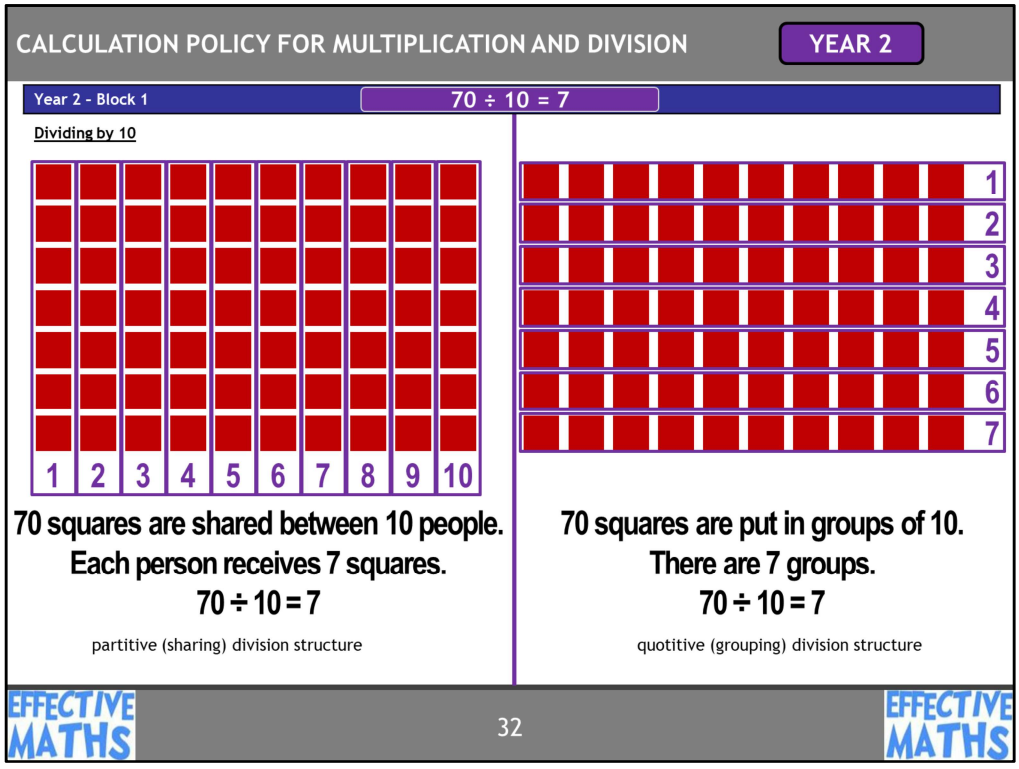
Odd and even numbers

Learning explores dividing by 2 using the context of odd and even numbers and children learn that even numbers can be divided exactly by 2.



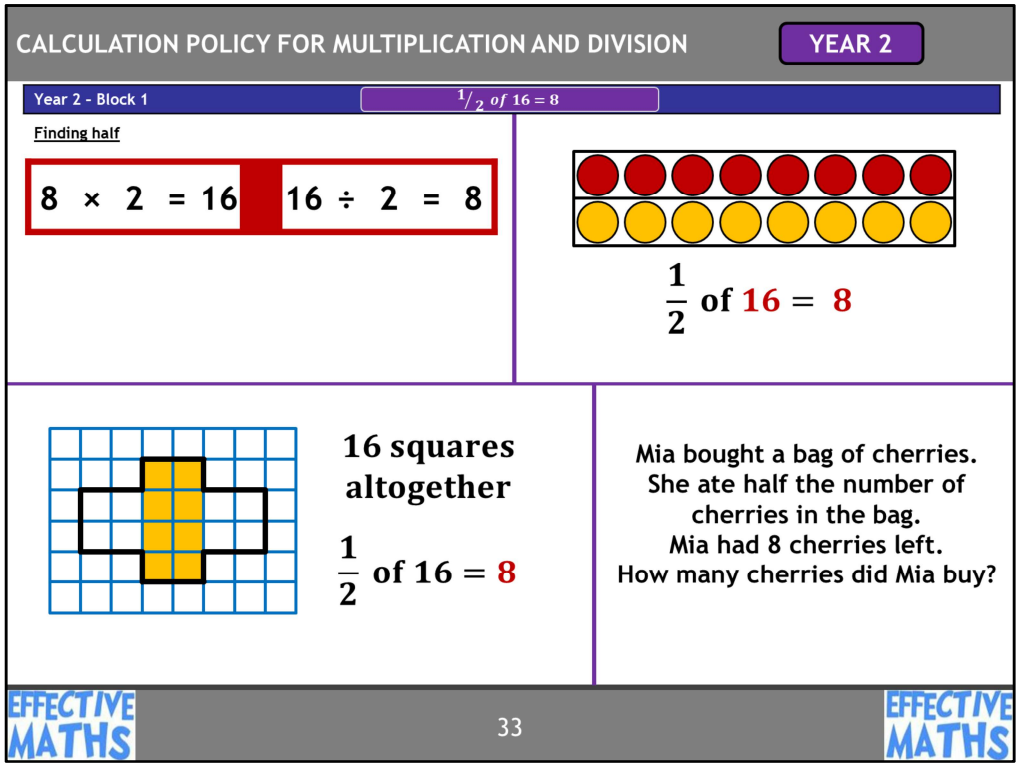
Dividing by 5

Learning to divide by 5 involves both sharing and grouping structures. Teaching seeks to help children to see where the quotient is in each structure:
for sharing - the number in each group;
for grouping – the number of groups.
The relationship triangle is used to help make links between multiplication and division.



Dividing by 10

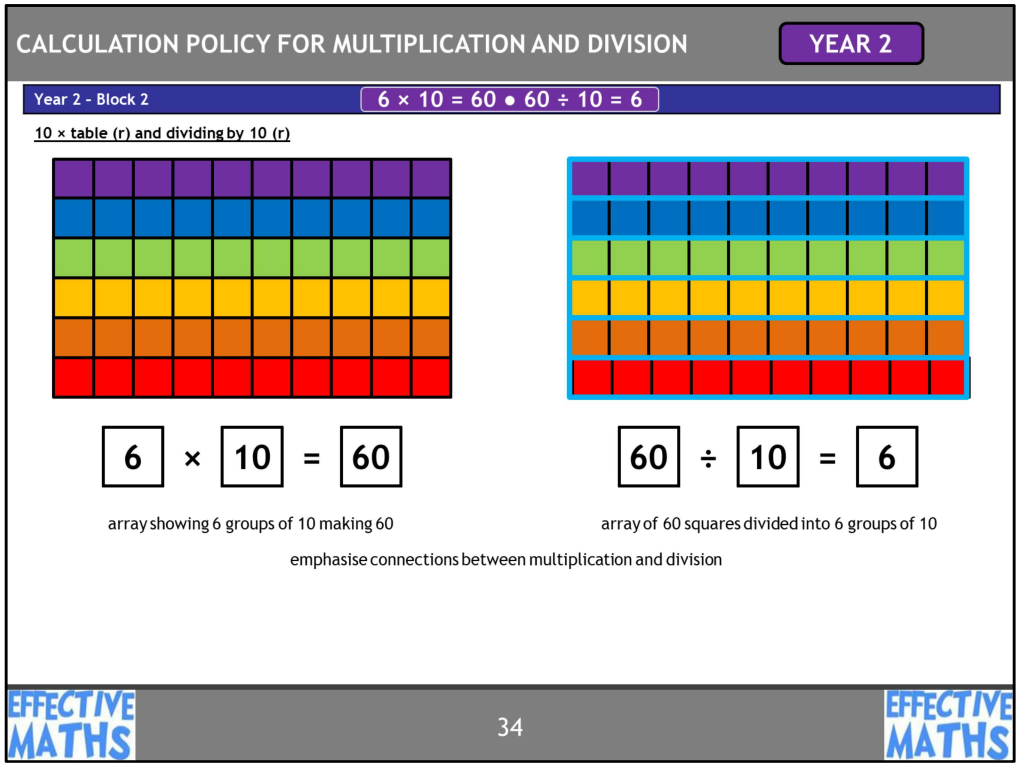
Block 1 concludes with learning to divide by 10, using both sharing and grouping structures.



BLOCK 1
FRACTIONS UNIT 1

Finding half

Learning to find half of a number, a group of objects or a shape begins by revisiting the connections between the 2 × table and its related division facts. The focus is on finding half of numbers to 20. Children engage in a range of contexts that involve finding half of even numbers to 20.

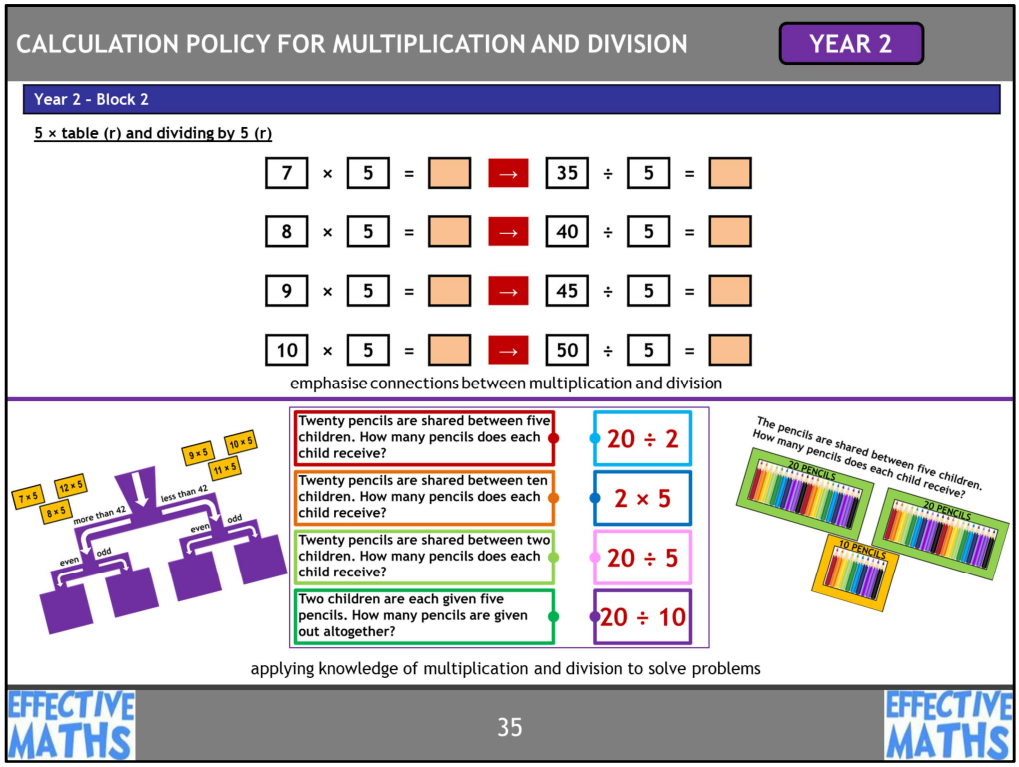


BLOCK 2
× AND ÷ UNIT 2

10 × table (r) and dividing by 10 (r)

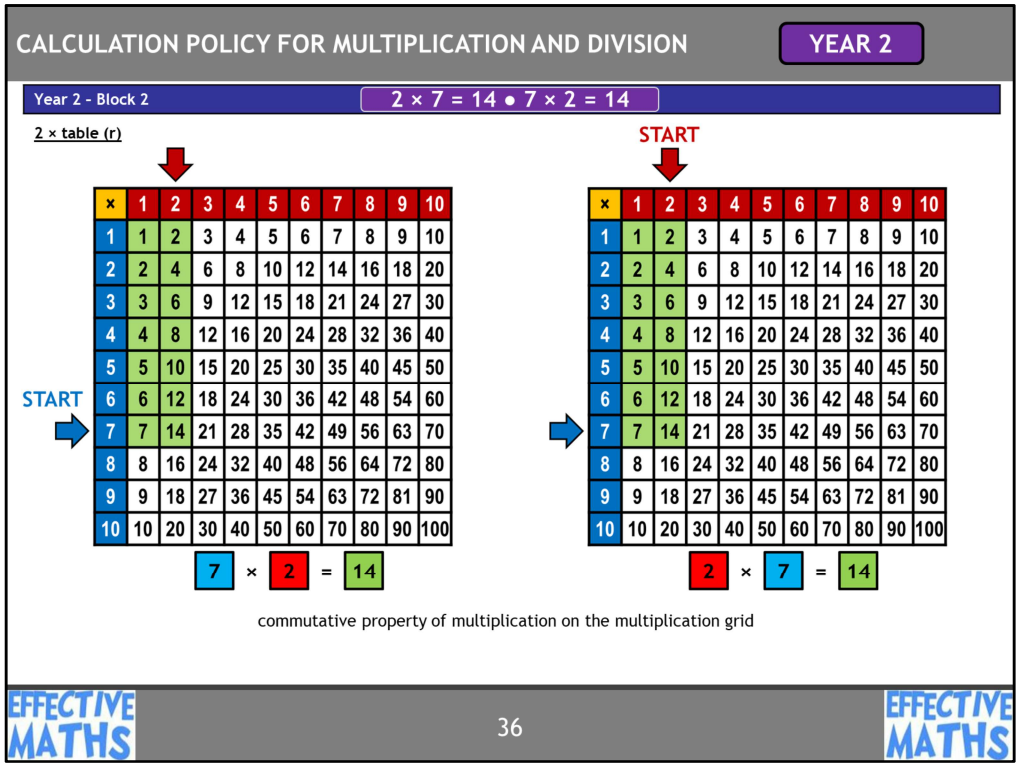
Block 2 begins with revision of the 10 × table and the related division facts. There are no new representations. Children continue to work with arrays, including arrays that support early understanding of the distributive property of multiplication.

There is an emphasis on strengthening connections between multiplication and division and this is echoed in fluency sessions. Children have had considerable exposure to the key concepts about multiplication and division and there should be a focus on committing multiplication and division facts to memory.



5 × table (r) and dividing by 5 (r)

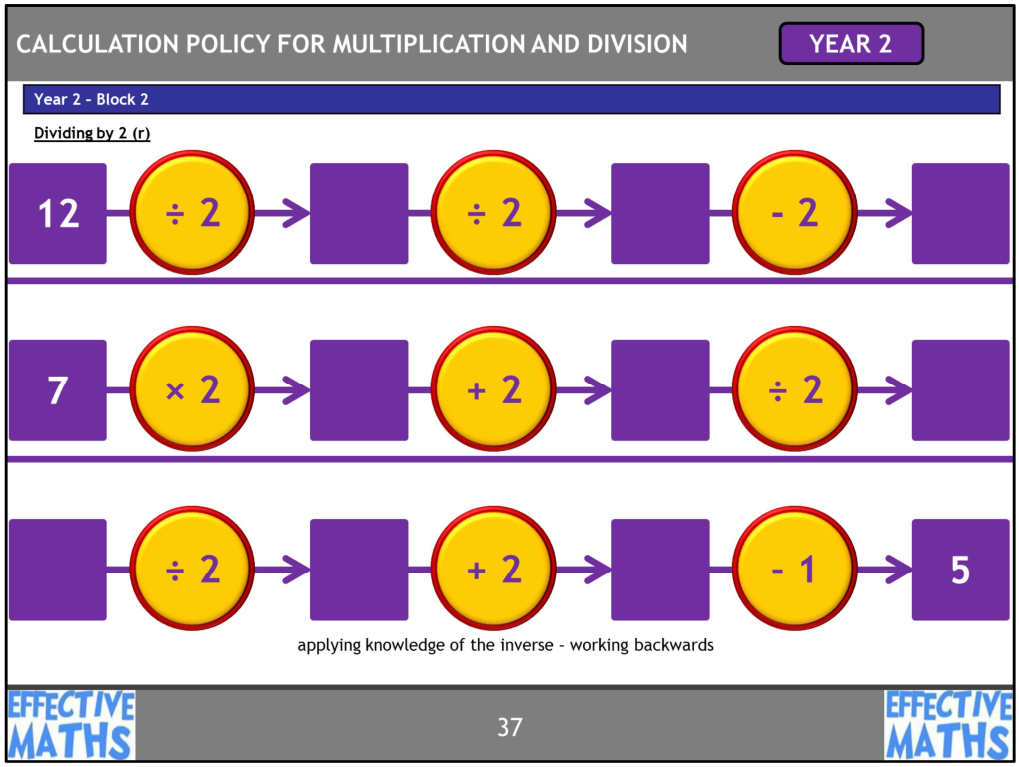
As with the 10 × table, there are no new representations. Again, there is an emphasis on strengthening connections between multiplication and division and this is echoed in fluency sessions. Throughout Block 2 there is a focus on applying knowledge of multiplication and division to solve problems.



2 × table (r)

Learning about the 2 × table does introduce a new representation: the multiplication grid. The core purpose of the lesson is to familiarise children with how the grid works as it is likely something they will encounter. Teaching introduces the commutative property and shows how we obtain the same product regardless of the order of the factors.

The multiplication grid may look a bit like a 100 square, but it works in a very different way. The multiplication grid is actually arrays. The first grid shows 7 rows of 2. The second shows 2 columns of 7.



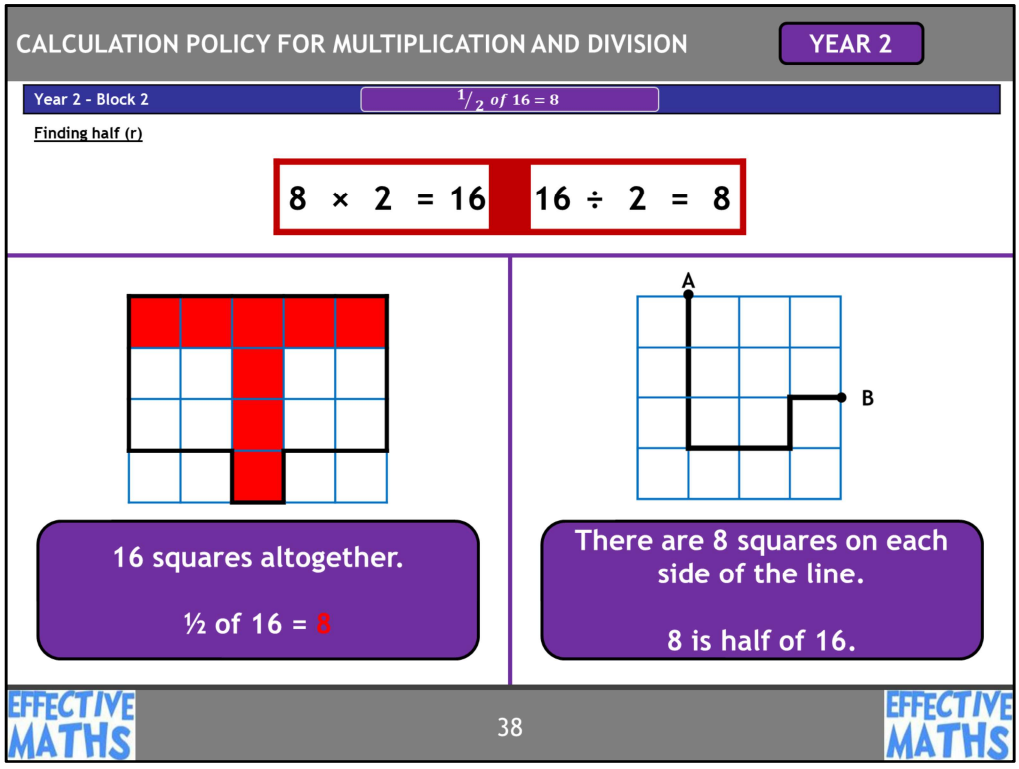
Dividing by 2 (r)

Solving problems involving dividing by 2 introduces the concept of inverse. Children will need to learn the term, but understanding of it is best achieved by talking about *working forwards* or *working backwards*.

In the case of 7 × 2 = __ we are working forwards.

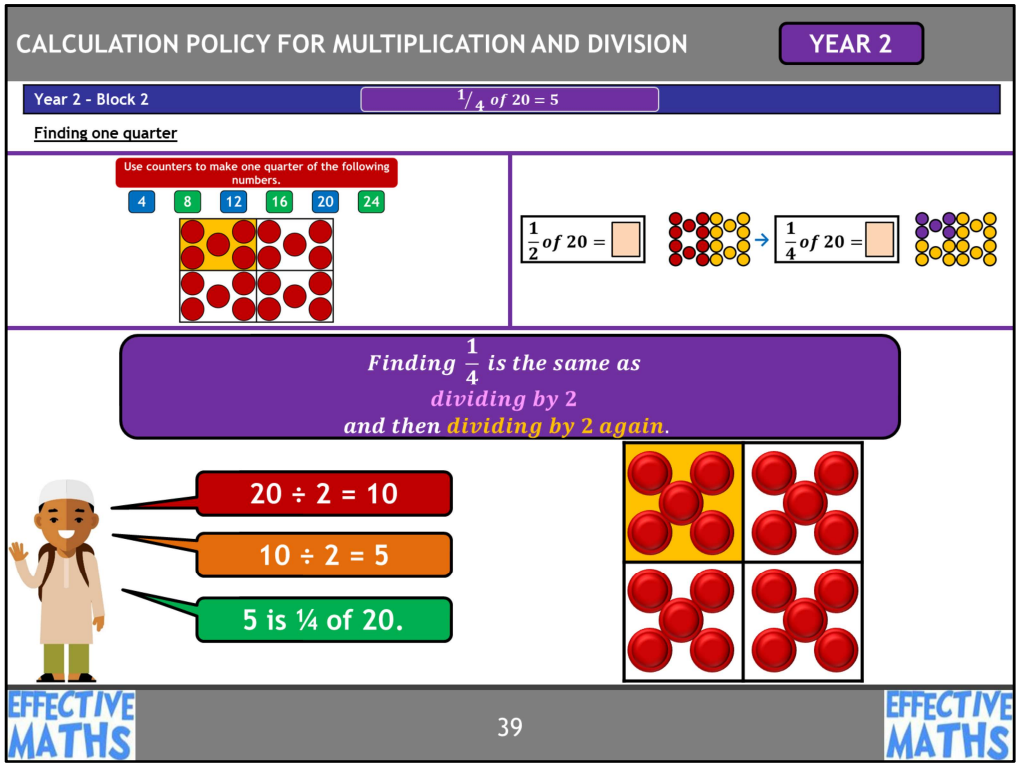
In the case of 14 = __ × 2 we are working backwards or using the inverse.

In the examples shown, we can solve row 1 and row 2 by working forwards. To solve row 3 we need to work backwards.



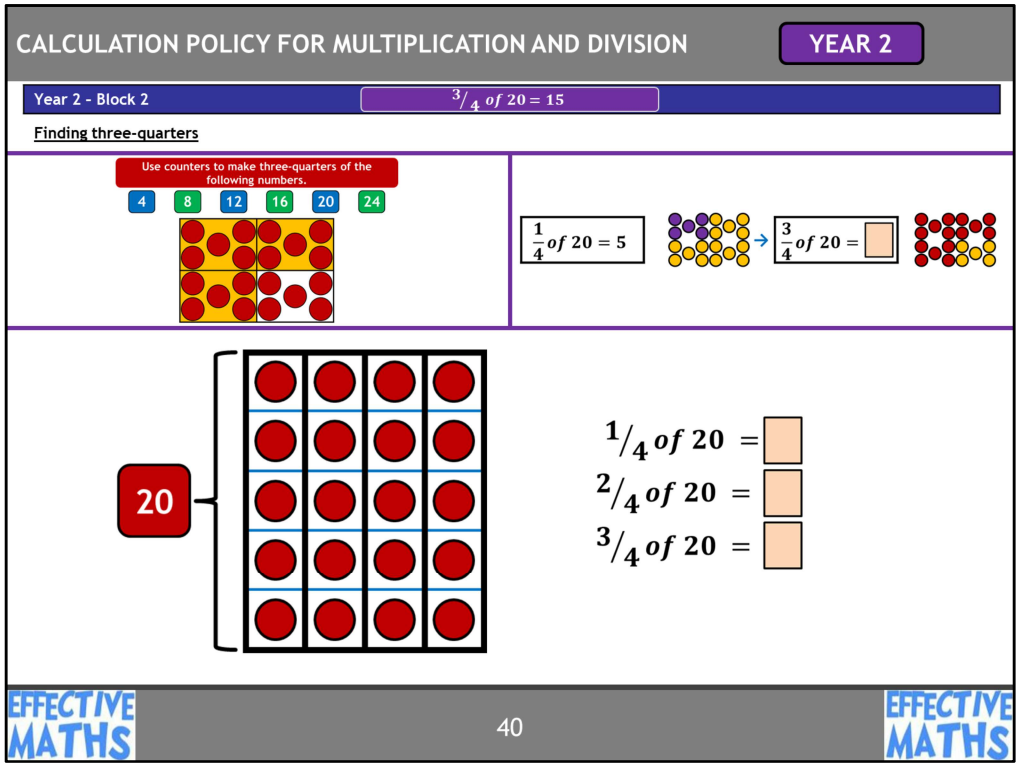
BLOCK 2
FRACTIONS UNIT 2

Finding half (r)
Revision of finding half of numbers to 20 continues to make connections between the 2 × table and its related division facts. Activities include shading shapes to show one-half and also drawing lines on grids to divide shapes into halves.



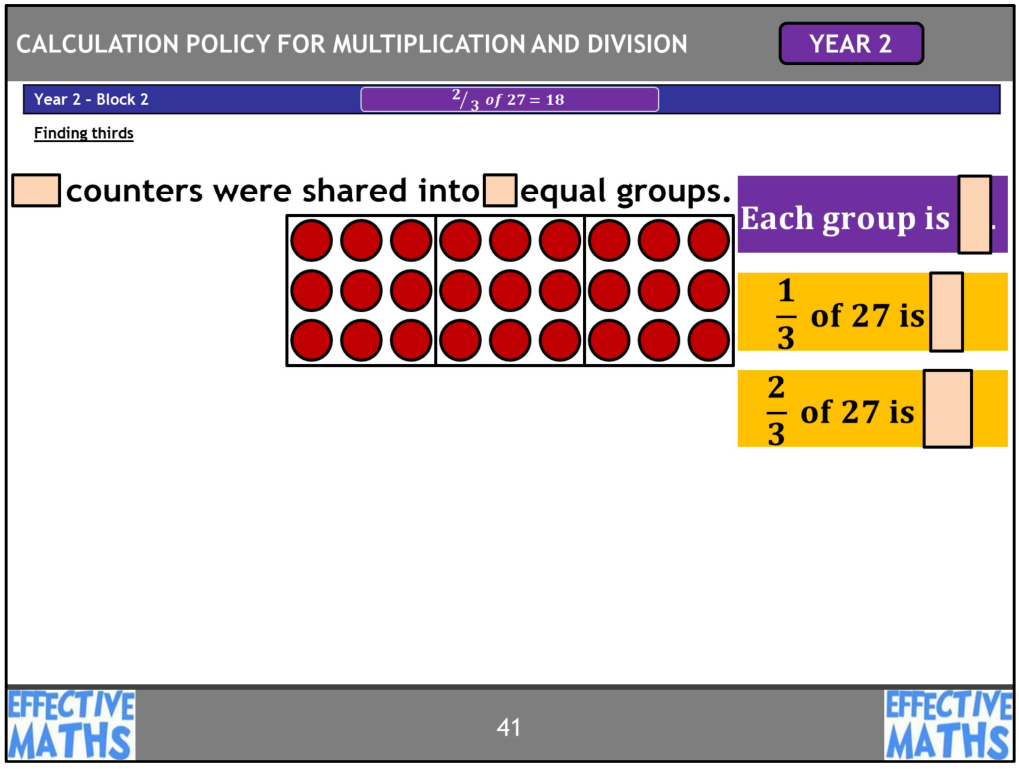
Finding one quarter

Children learn that one quarter of a set of objects occurs when the whole is split into 4 equal parts. Note that the 4 × table has not been taught in Year 2 – it is taught in Year 3 – so children cannot use their knowledge of division facts to obtain one quarter. A range of approaches are used, including using concrete resources, encouraging the use of drawing and linking to knowledge of finding half.



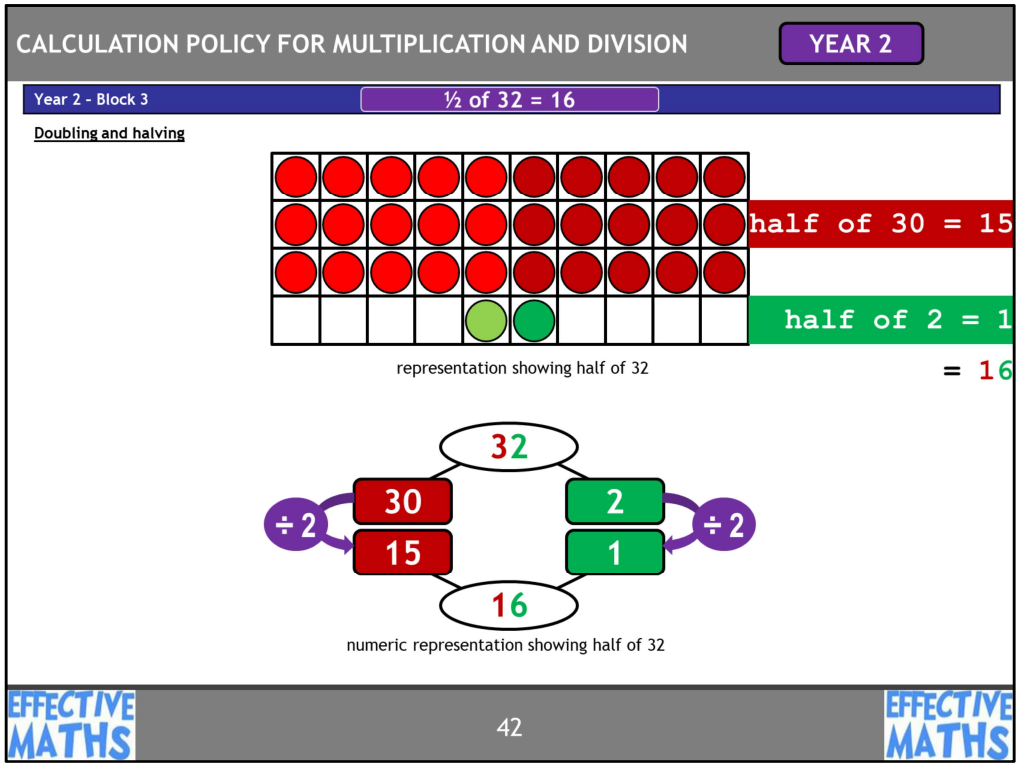
Finding three-quarters

Finding three-quarters of a set is initially done through using concrete resources. Connections are also made to finding one quarter: *if one quarter is 5, then two-quarters is 10 and three-quarters is 15.*



Finding thirds

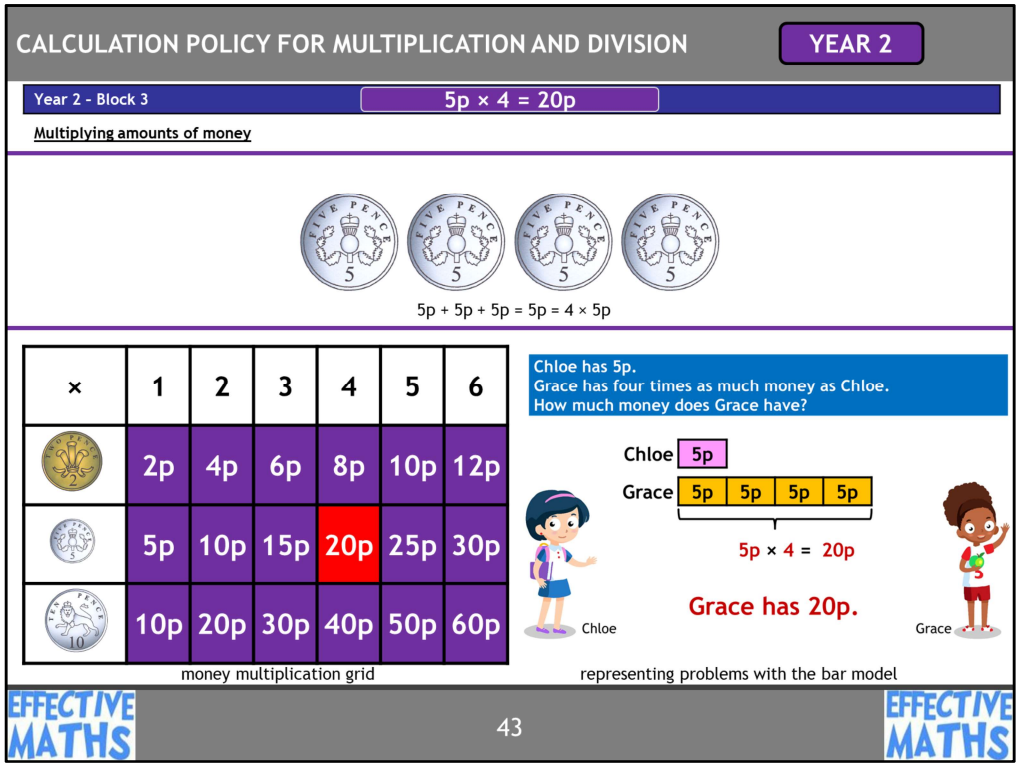
Children learn that one third of a set of objects occurs when the whole is split into 3 equal parts. Note that the 3 × table has not been taught in Year 2 – it is taught in Year 3 – so children cannot use their knowledge of division facts to obtain one third. Nor can they make links to other maths facts they know. They have had experience of counting in threes and the use of concrete resources, visual representations and drawing are the prime strategies for finding thirds. As for learning to find three-quarters, children apply their knowledge of finding one-third to finding two-thirds.



BLOCK 3
CALCULATION UNIT

Doubling and halving

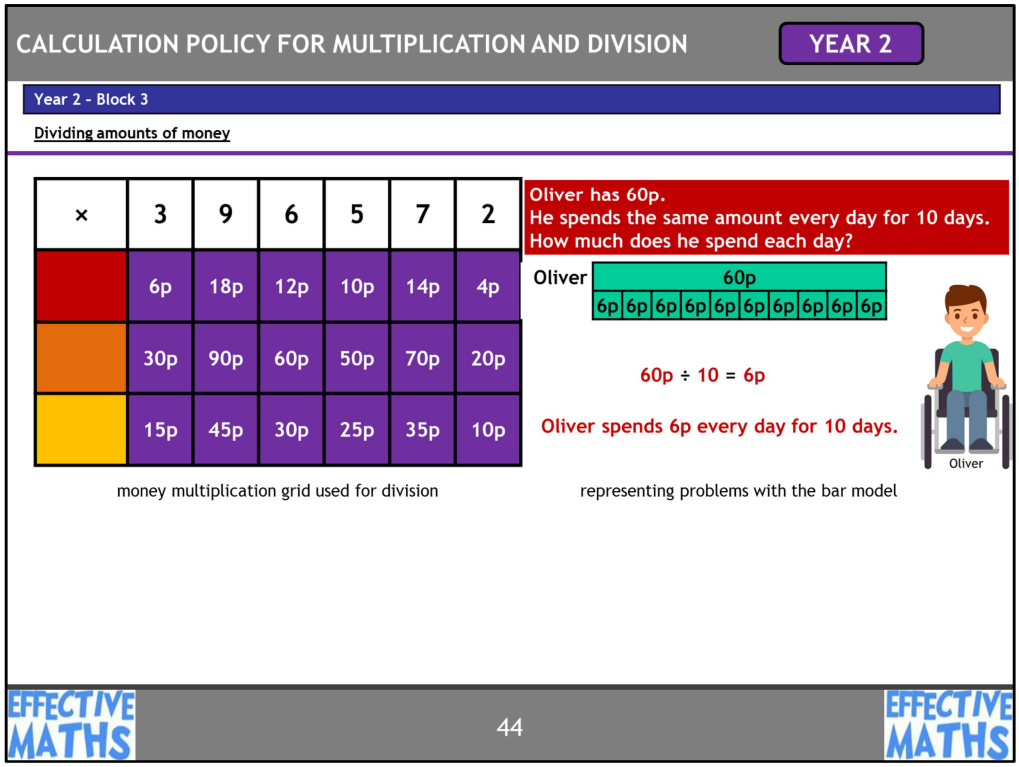
Understanding of doubling and halving is extended to finding double/half of two-digit numbers beyond 20. The strategy modelled is to partition the two-digit number into tens and ones, find half of each part, and then combine. Children need to know half of multiples of 10 to 90 and half of the even numbers 2, 4, 6 and 8.



BLOCK 3
MONEY UNIT 2

Multiplying amounts of money

Children's knowledge of multiplication facts is applied to the context of money. Visual representations emphasise the repeated addition structure of multiplication. Children find missing amounts on a money multiplication grid and develop the ability to represent problems with bar models.



Dividing amounts of money

The money multiplication grid is used for division. Teaching makes explicit links with multiplication.

3 × __ = 6p

6p ÷ 3 = 2p

Children continue to develop the ability to represent problems with bar models.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Calculation content	MULTIPLICATION AND DIVISION (UNIT 1) • 5 × table (r) • 4 × table • 8 × table • 3 × table • Dividing by 4 • Dividing by 8 • Dividing by 3 FRACTIONS (UNIT 1) • Finding unit fractions of quantities MULTIPLICATION AND DIVISION (UNIT 2) • Multiplying by teen numbers (partitioning) • Multiplying multiples of ten by 1-digit numbers • Multiplying 2-digit numbers by 4 (expanded column method) • Multiplying 2-digit numbers by 8 (expanded column method)	MONEY AND DECIMALS (UNIT 1) n/a MULTIPLICATION AND DIVISION (UNIT 3) • 4 × table (r) • 8 × table (r) • 3 × table (r) • Multiplying teen numbers (partitioning) and multiplying multiples of ten (r) • Multiplying 2-digit numbers by 3 (expanded column method) • Division facts linked to the 4 and 8 × tables (r) • Division facts linked to the 3 × table (r) • Dividing multiples of ten • Dividing by partitioning (÷ by 4 and 8) • Dividing by partitioning (÷ by 3) FRACTIONS (UNIT 2) n/a	CALCULATION UNIT • Multiplying 2-digit numbers (compact column method) • Dividing a 2-digit number (short division) MONEY AND DECIMALS (UNIT 2) n/a

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	5 × table (r) Block 1 begins by revisiting the 5 × table and introduces some new vocabulary to children (factor, multiplier, multiplicand and product). Children's understanding is deepened as they encounter arrays on blank multiplication grids. As learning progresses these arrays become partitioned and children are exposed to the distributive property of multiplication: 6 × 5 = 2 × 5 + 4 × 5. 4 × table Learning about the 4 × table also continues to make use of arrays. They revisit learning from Year 2 that whilst the repeated addition describes the arrays, 4 + 4 + 4 + 4 + 4 + 4 + 4 is not as efficient as 6 × 4. They learn that multiplication takes precedence over addition. Children continue to be exposed to the distributive property of multiplication (not referred to as such) to deepen understanding about multiplication.	4, 8 and 3 × tables (revision) × and ÷ Unit 3 begins with revision of the 4, 8 and 3 × tables. No new representations are encountered. Teaching stresses the commutative nature of multiplication and shows how we obtain the same product regardless of the order of the factors. The multiplication grid may look a bit like a 100 square, but it works in a very different way. The multiplication grid is actually arrays. The first grid shows 5 rows of 4. The second shows 4 columns of 5. Children continue to be exposed to the distributive property of multiplication (not referred to as such) to deepen understanding about multiplication. For example: 10 × 3 + 2 × 3 = 12 × 3.	Multiplying 2-digit numbers (compact column method) Children have multiplied numbers by using partitioning, including representing this partitioning with the expanded column method. Arrays and base ten representations support conceptual understanding as the compact column method is introduced. The use of language is key to ensure conceptual understanding, particularly around the exchanging of ones for tens. Language for 36 × 3 *6 ones × 3 = 18 ones = 1 ten and 8 ones.* *3 tens × 3 = 9 tens + the 1 ten = 10 tens = 1 hundred.*

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>8 × table</u> Learning the 8 × table makes links to children's developing knowledge of the 4 × table, eg: 2 × 4 = 8 2 × 8 = 16 Children continue to encounter arrays and are introduced to the open array. In an open array, the squares or individual objects are not indicated within the interior of the array rectangle. An open array does not have to be drawn to scale. The challenge task in the 4 × table lesson involved exploring the pattern formed in the ones digits of the products. In the 8 × table lesson all children explore the pattern formed in the products of the 8 × table.	<u>Multiplying by teen numbers and multiplying multiples of ten (r)</u> × and ÷ Unit 2 introduced multiplying by teen numbers: finding facts beyond the multiplication tables, using facts from within them. Arrays supported conceptual understanding. Unit 3 introduces a numeric representation to support conceptual understanding of the partitioning method. Children consolidate their understanding of multiplying multiples of ten.	<u>Dividing a 2-digit number (short division)</u> Children have experience of division facts linked to the multiplication tables they know and also of using partitioning to divide. They are now introduced to the formal algorithm for short division. The following sequence is followed: • both digits in a 2-digit number are multiples of the divisor (eg 69 ÷ 3); • 2-digit number is a multiple of the divisor, but the tens digit is not (eg 75 ÷ 3). Base 10 and the partitioning method support conceptual understanding. <u>Using base 10 for 75 ÷ 3</u> Share the 6 of the tens equally between three groups. You have one ten left over. It cannot be shared, so say: *Let's exchange 1 ten for 10 ones. Now we have 15 ones.* Share the 15 ones equally between the three groups.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	3 × table The final multiplication table learnt in Year 3 is the 3 × table. The emphasis in learning here is to use a known fact to derive a new fact, eg: 6 × 3 = 18 so 7 × 3 = 18 plus one more lot of 3 = 21. After children have been introduced to the 4, 8 and 3 multiplication tables teachers provide plenty of opportunities for these to be practised. When children commit multiplication table facts to memory, they do so using a verbal sound pattern to associate the 3 relevant numbers, for example, "seven threes make twenty-one". It is important to provide opportunities for pupils to verbalise each multiplication fact as part of the process of developing fluency. (DfE Ready to Progress guidance) Read them as 'One three is three; two threes make six; three threes make nine' etc.	Multiplying 2-digit numbers by 3 × and ÷ Unit 2 introduced the expanded column method to multiply 2-digit numbers by 4 and 8. (These are multiplication tables children typically have better recall of than the 3 × table.) Multiplying 2-digit numbers by 3 is introduced in Unit 3. Base 10 supports understanding of the expanded column method. Accurate use of language is key to ensuring conceptual understanding. For example: *8 ones × 3 = 24 ones = 24* *6 tens × 3 = 18 tens = 180*	Using partitioning for 75 ÷ 3 Partition 75 into parts that are divisible by 3, highlighting that those parts are 60 and 15 not 70 and 5. Divide each part by 3. Combine the parts to obtain 25. Using short division for 75 ÷ 3 Write the dividend (75) and then draw the frame. Write the divisor on the left of the dividend. Say: *7 tens ÷ by 3 = 2 tens with 1 ten left over.* *Exchange 1 ten for 10 ones.* *15 ones divided by 3 = 5 ones.*

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	4, 8 and 3 × tables A problem solving lesson concludes the work on multiplication facts. Children encountered the multiplication grid in Year 2. The problem solving lesson seeks to further develop children's understanding of the multiplication grid. They will need this knowledge for the division lessons where they will learn to use the multiplication grid to derive division facts. The division lessons begin with starter activities revisiting multiplication facts. One of the representations encountered in these activities is the multiplication grid.	Dividing by 4, 8 and 3 (r) The second half of the unit focuses on division and begins with revision of division facts linked to the 4, 8 and 3 × tables. Children are reminded how to use the multiplication grid to obtain division facts and about the sharing/grouping structures for division. Relationship triangles reinforce the connections between multiplication and division. Children solve problems involving division facts linked to the 4, 8 and 3 × tables. Dividing multiples of ten Children have experienced using known facts in unit 2 (and earlier in this unit) when they multiplied multiples of ten. They now use scaling for division facts derived from multiplication tables. Use of language is key. 6 ones divided by 3 = 2 ones 6 tens divided by 3 = 2 tens 60 ÷ 3 = 20	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by 4</u> Learning to divide by 4 introduces some new vocabulary to children (dividend, divisor and quotient). In Year 2 children encountered two division structures, sharing and grouping. This continues in Year 3 and they interpret diagrams using both structures. Children should be familiar with the relationship triangle and these are used to promote links between multiplication facts and division facts. Teaching introduces children to using the multiplication grid to find division facts. <u>Dividing by 8</u> Learning to divide by 8 continues to develop understanding of sharing and grouping. Children are encouraged to make direct comparisons between the two structures. They continue to use the multiplication grid to find division facts.	<u>Dividing by partitioning</u> Children's experience of division now extends to situations where the dividend is not in the multiplication tables they know. They learn to partition the dividend into multiples of the divisor. In the case of 56 ÷ 4 one way to partition 56 would be 40 and 16. Each part is then divided by 4 and the resulting quotients combined. 56 ÷ 4 = 40 ÷ 4 + 16 ÷ 4 = 10 + 4 = 14 Clearly the dividend can be partitioned into any multiples of the divisor. 56 ÷ 4 = 20 ÷ 4 + 36 ÷ 4 = 5 + 9 = 14	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by 3</u> The final lesson of the unit focuses on dividing by 3. The concepts (sharing and grouping) and representations (arrays, relationship triangles and multiplication grids) should be familiar to the children. <u>Finding unit fractions of quantities</u> Children have had lots of experience finding halves, thirds and quarters from Year 2 and earlier in the Year 3 fractions unit. That experience is now extended to finding fifths, eighths and tenths (linked to multiplication tables they should know/be learning). Teaching stresses the connection between a unit fraction of a quantity and dividing that quantity by the denominator. Visual representations and careful use of language support understanding. Learning progresses from describing situations where the value of a part is visible to situations where the value of a part cannot be seen.		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

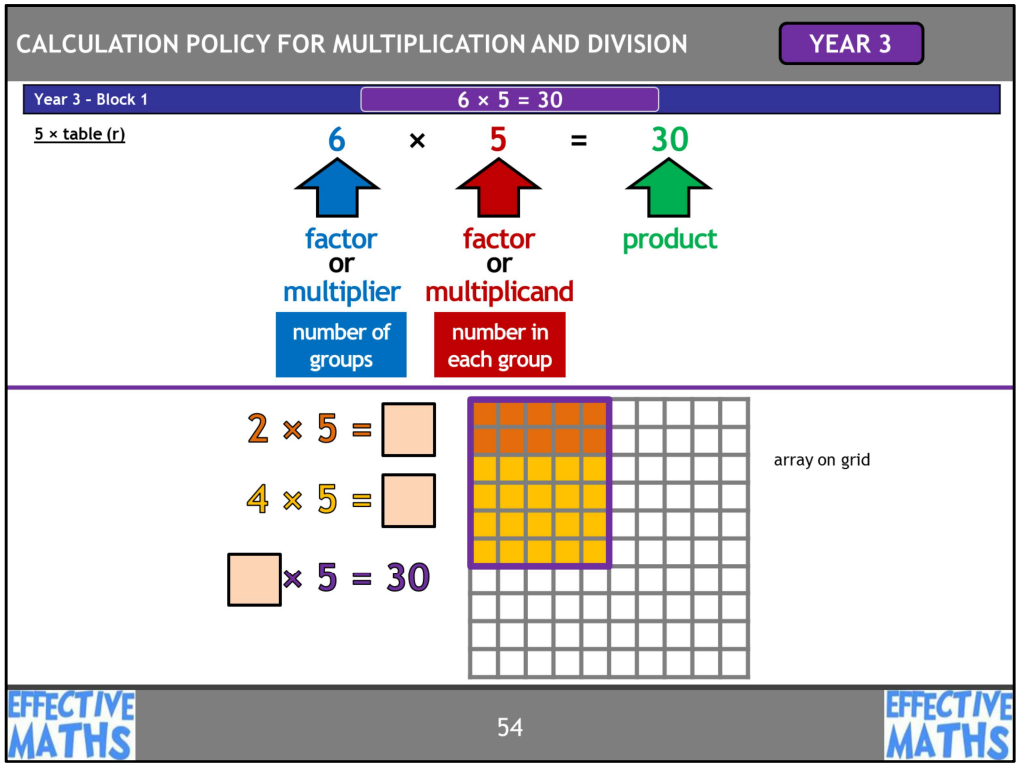
Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Multiplying by teen numbers Children have considerable experience of partitioning arrays to derive multiplication facts within the multiplication tables. This is now extended to derive facts beyond the multiplication tables, using facts from within them. Multiplying multiples of ten by 1-digit numbers Scaling is used to derive new facts from known facts. For example: 6 × 3 = 18 60 × 3 = 6 tens × 3 = 18 tens = 180 Base ten is used to support conceptual understanding. As you say '18 tens' it is useful to write 180 (underlining the zero as you say 'tens'). Then read 18 tens/180 as one hundred and eighty/180.		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 3

Year 3			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Multiplying 2-digit numbers by 4</u> Learning from the previous two steps, multiplying teen numbers and multiplying multiples of ten, is used to introduce children to the expanded column method for multiplication. This is done by solving a calculation using a known method (partitioning an array), then solving the same calculation with base 10 blocks and finally using the expanded column method. Teaching makes connections between all three representations. <u>Multiplying 2-digit numbers by 8</u> Arrays continue to support understanding, but the emphasis moves more towards base 10 supporting understanding of the expanded column method. Accurate use of language is key. For example: *5 ones × 8 = 40 ones = 40* *3 tens × 8 = 24 tens = 240*		

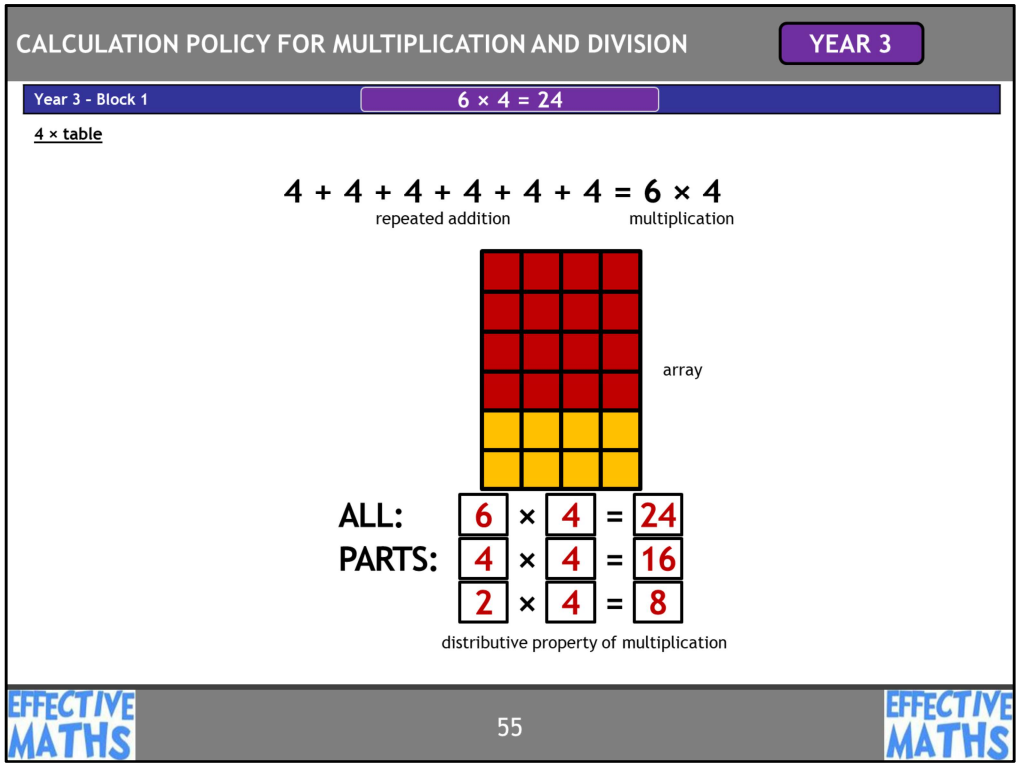
EFFECTIVE MATHS 53 EFFECTIVE MATHS



BLOCK 1
× AND ÷ UNIT 1

5 × table (r)
Block 1 begins by revisiting the 5 × table and introduces some new vocabulary to children (factor, multiplier, multiplicand and product). Children's understanding is deepened as they encounter arrays on blank multiplication grids. As learning progresses these arrays become partitioned and children are exposed to the distributive property of multiplication:
6 × 5 = **2** × 5 + **4** × 5.

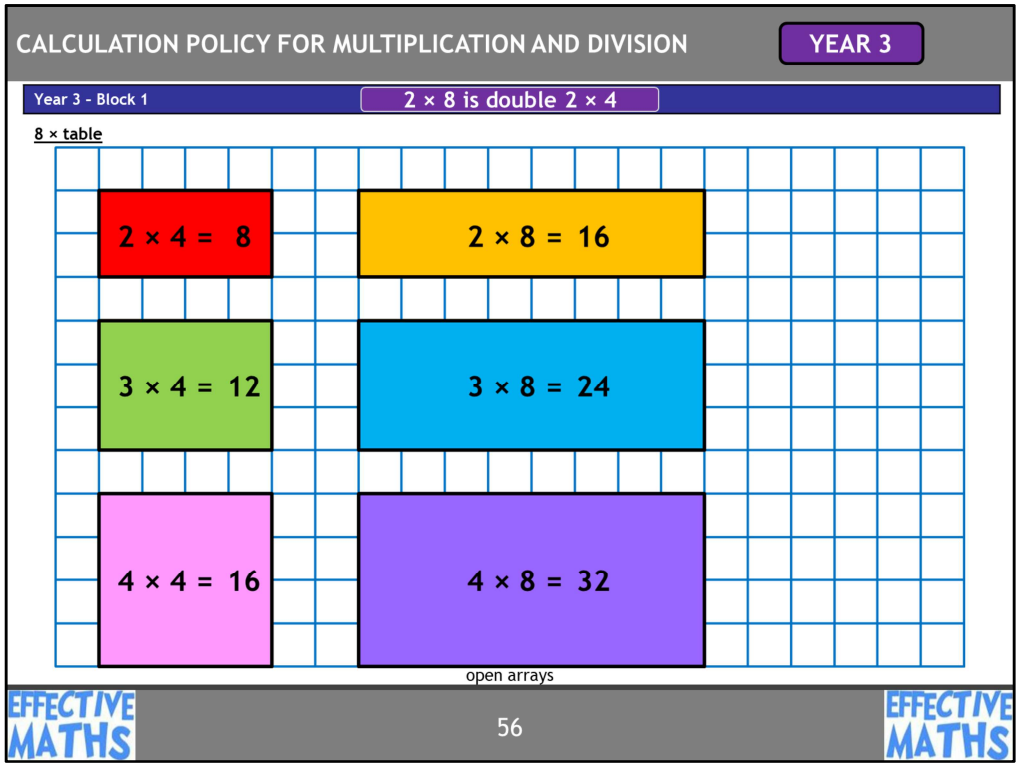
The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression.



4 × table

Learning about the 4 × table also continues to make use of arrays. They revisit learning from Year 2 that whilst the repeated addition describes the arrays, 4 + 4 + 4 + 4 + 4 + 4 is not as efficient as 6 × 4. They learn that multiplication takes precedence over addition.

Children continue to be exposed to the distributive property of multiplication (not referred to as such) to deepen understanding about multiplication. For example:
6 × 4 = 24
4 × 4 = 16
2 × 4 = 8



8 × table

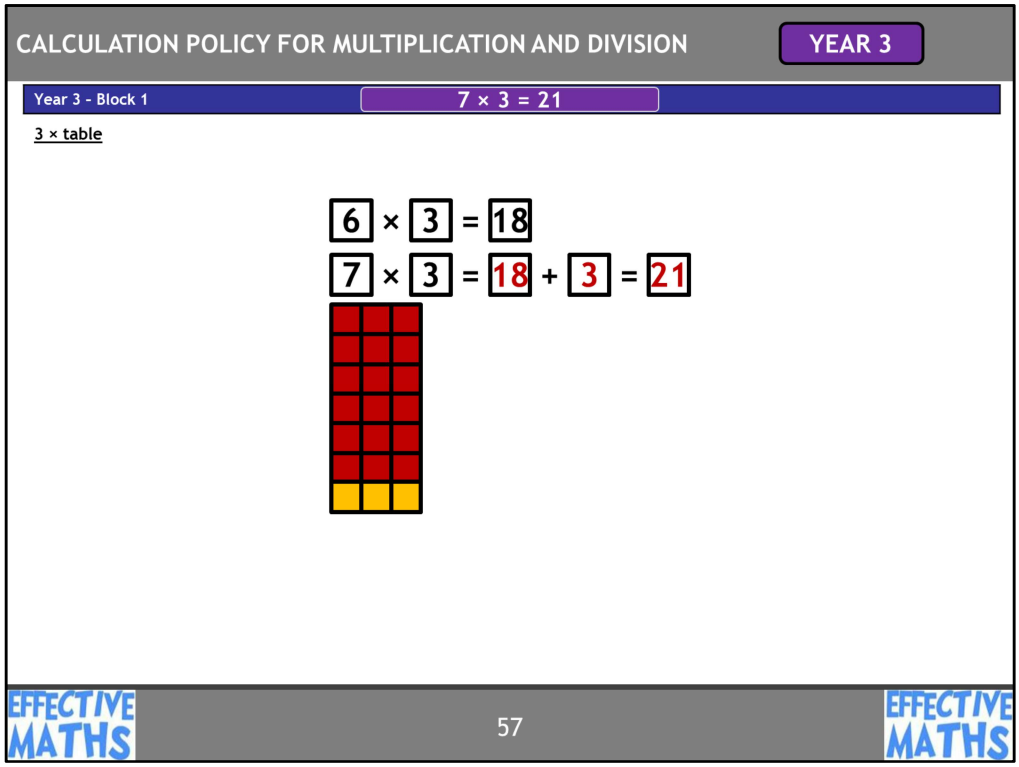
Learning the 8 × table makes links to children's developing knowledge of the 4 × table, eg:

2 × 4 = 8

2 × 8 = 16

Children continue to encounter arrays and are introduced to the open array. In an open array, the squares or individual objects are not indicated within the interior of the array rectangle. An open array does not have to be drawn to scale.

The challenge task in the 4 × table lesson involved exploring the pattern formed in the ones digits of the products. In the 8 × table lesson all children explore the pattern formed in the products of the 8 × table.

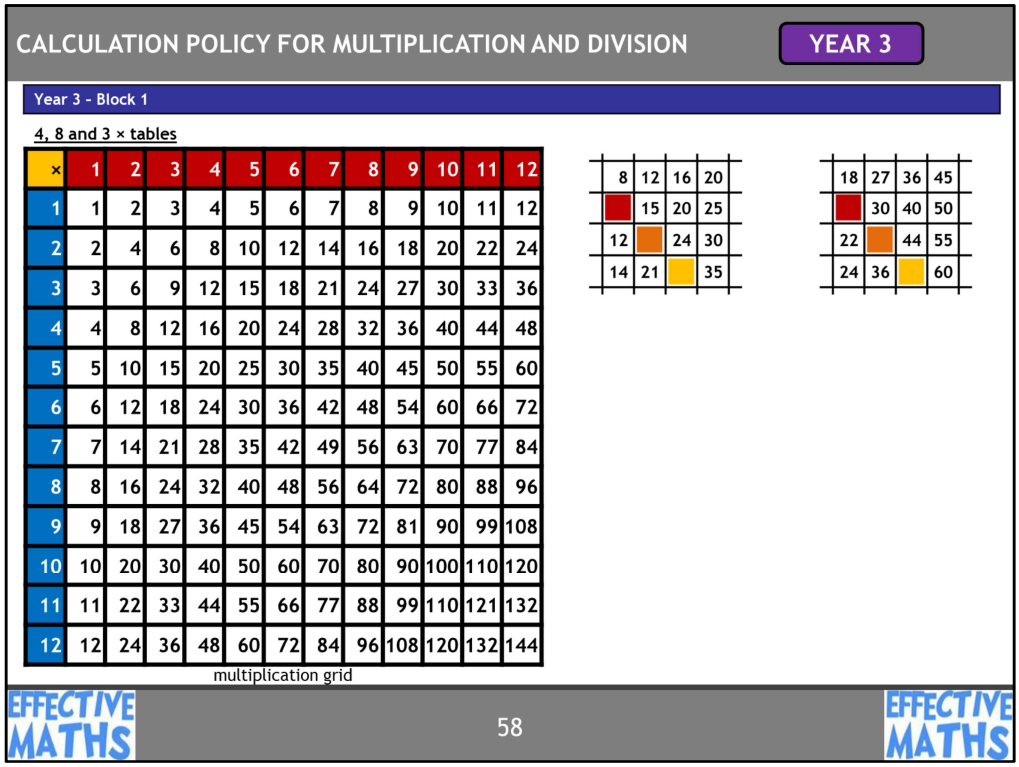


3 × table

The final multiplication table learnt in Year 3 is the 3 × table. The emphasis in learning here is to use a known fact to derive a new fact, eg:
6 × 3 = 18 so
7 × 3 = 18 plus one more lot of 3 = 21.
After children have been introduced to the 4, 8 and 3 multiplication tables teachers provide plenty of opportunities for these to be practised.

When children commit multiplication table facts to memory, they do so using a verbal sound pattern to associate the 3 relevant numbers, for example, “seven threes make twenty-one”. It is important to provide opportunities for pupils to verbalise each multiplication fact as part of the process of developing fluency. (DfE Ready to Progress guidance)

Read them as ‘One three is three; two threes make six; three threes make nine’ etc.



×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

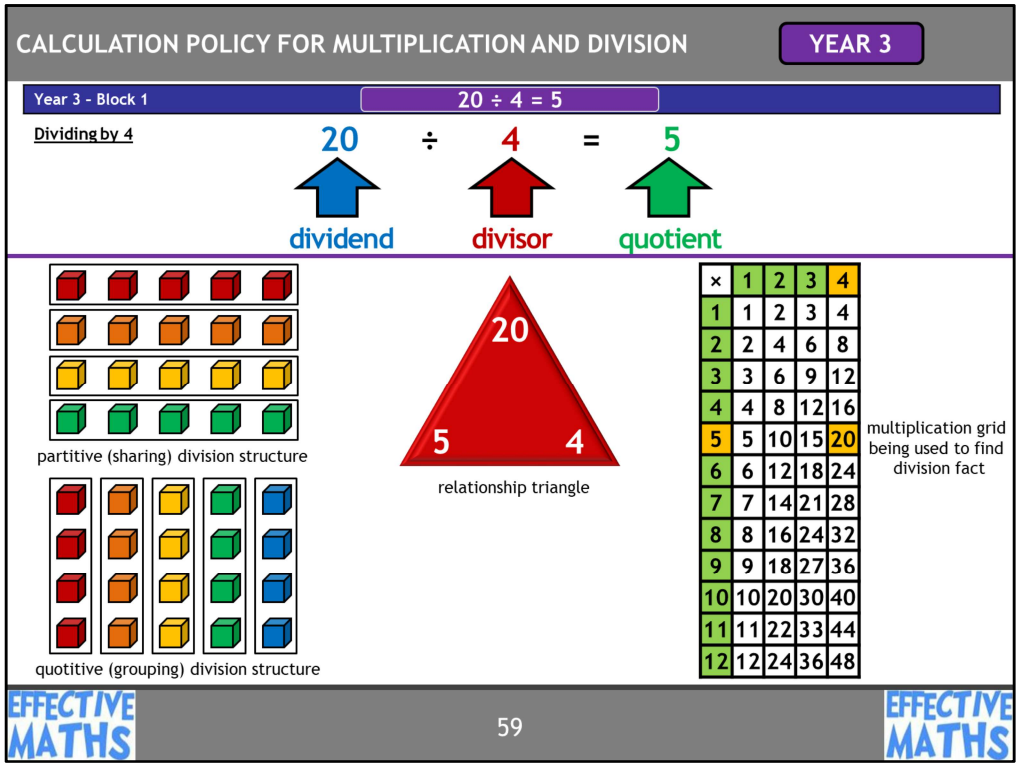
8	12	16	20
	15	20	25
12		24	30
14	21		35

18	27	36	45
	30	40	50
22		44	55
24	36		60

4, 8 and 3 × tables

A problem solving lesson concludes the work on multiplication facts.

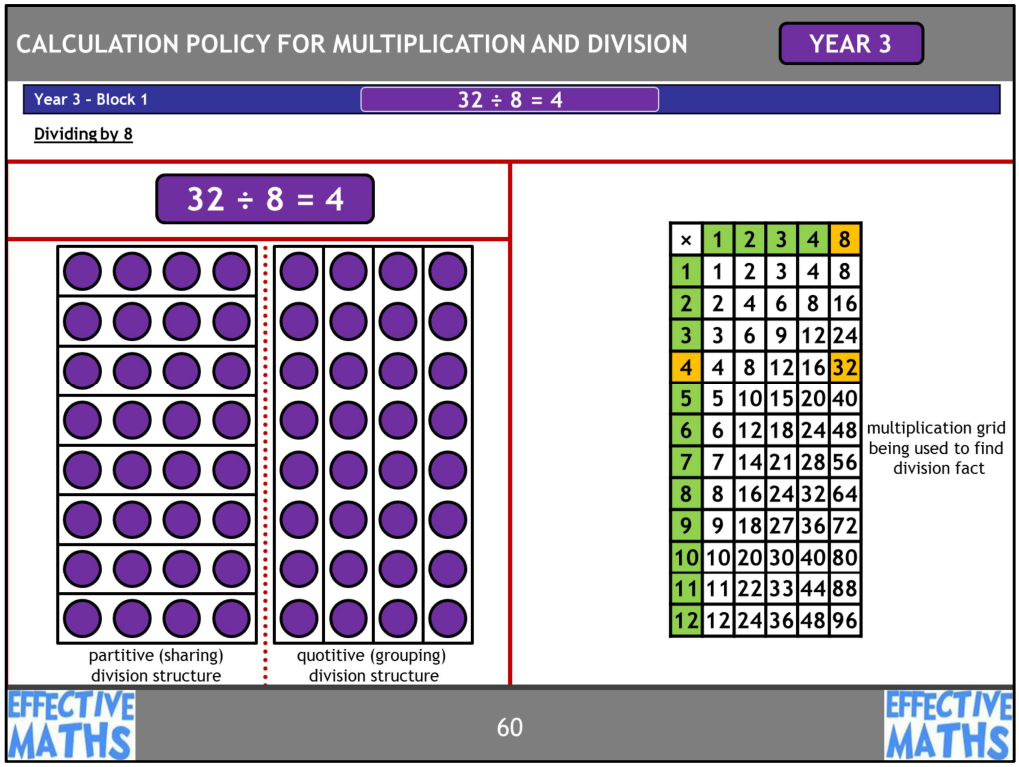
Children encountered the multiplication grid in Year 2. The problem solving lesson seeks to further develop children's understanding of the multiplication grid. They will need this knowledge for the division lessons where they will learn to use the multiplication grid to derive division facts. The division lessons begin with starter activities revisiting multiplication facts. One of the representations encountered in these activities is the multiplication grid.



×	1	2	3	4
1	1	2	3	4
2	2	4	6	8
3	3	6	9	12
4	4	8	12	16
5	5	10	15	20
6	6	12	18	24
7	7	14	21	28
8	8	16	24	32
9	9	18	27	36
10	10	20	30	40
11	11	22	33	44
12	12	24	36	48

Dividing by 4

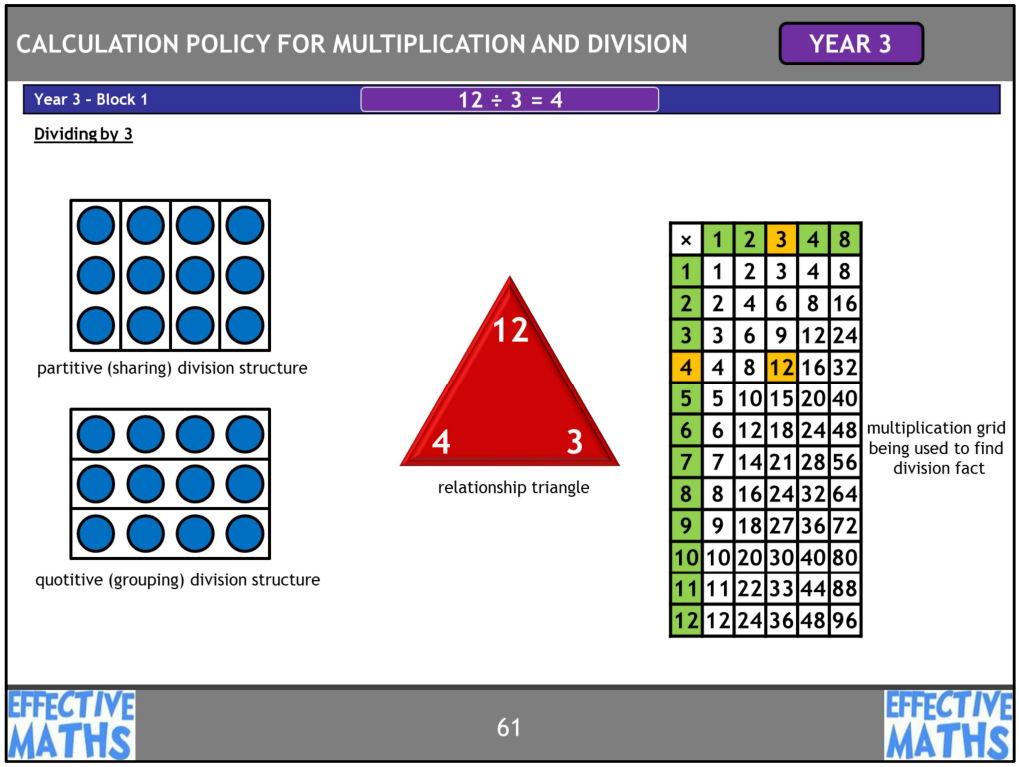
Learning to divide by 4 introduces some new vocabulary to children (dividend, divisor and quotient). In Year 2 children encountered two division structures, sharing and grouping. This continues in Year 3 and they interpret diagrams using both structures. Children should be familiar with the relationship triangle and these are used to promote links between multiplication facts and division facts. Teaching introduces children to using the multiplication grid to find division facts.



×	1	2	3	4	8
1	1	2	3	4	8
2	2	4	6	8	16
3	3	6	9	12	24
4	4	8	12	16	32
5	5	10	15	20	40
6	6	12	18	24	48
7	7	14	21	28	56
8	8	16	24	32	64
9	9	18	27	36	72
10	10	20	30	40	80
11	11	22	33	44	88
12	12	24	36	48	96

Dividing by 8

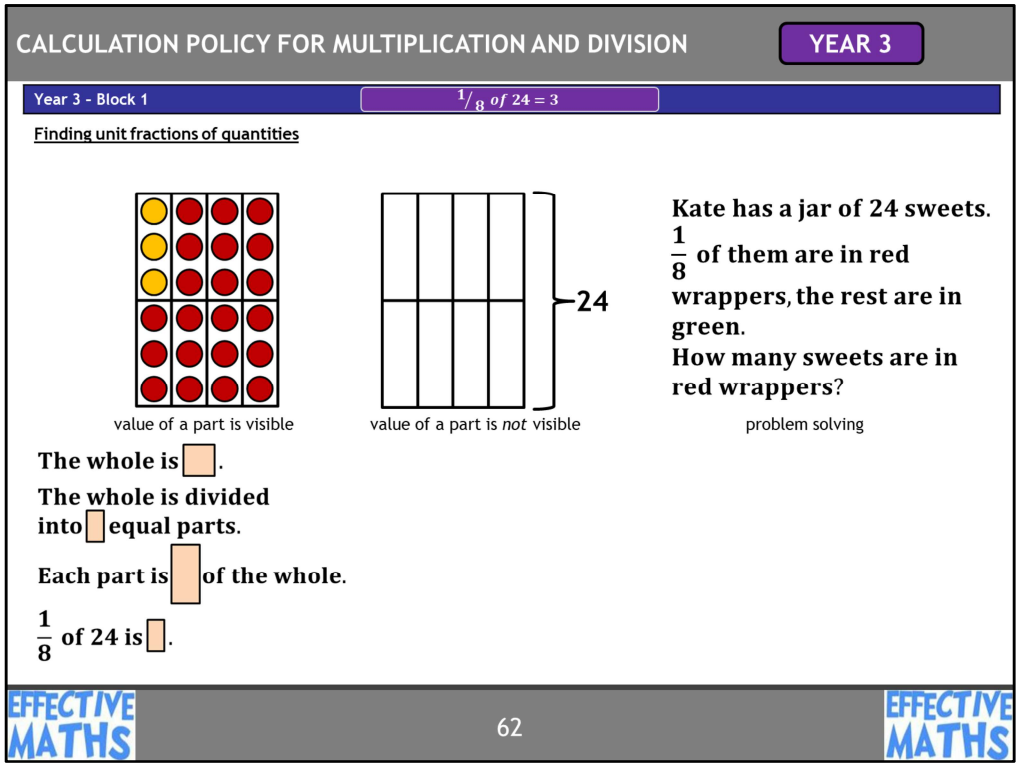
Learning to divide by 8 continues to develop understanding of sharing and grouping. Children are encouraged to make direct comparisons between the two structures. They continue to use the multiplication grid to find division facts.



×	1	2	3	4	8
1	1	2	3	4	8
2	2	4	6	8	16
3	3	6	9	12	24
4	4	8	12	16	32
5	5	10	15	20	40
6	6	12	18	24	48
7	7	14	21	28	56
8	8	16	24	32	64
9	9	18	27	36	72
10	10	20	30	40	80
11	11	22	33	44	88
12	12	24	36	48	96

Dividing by 3

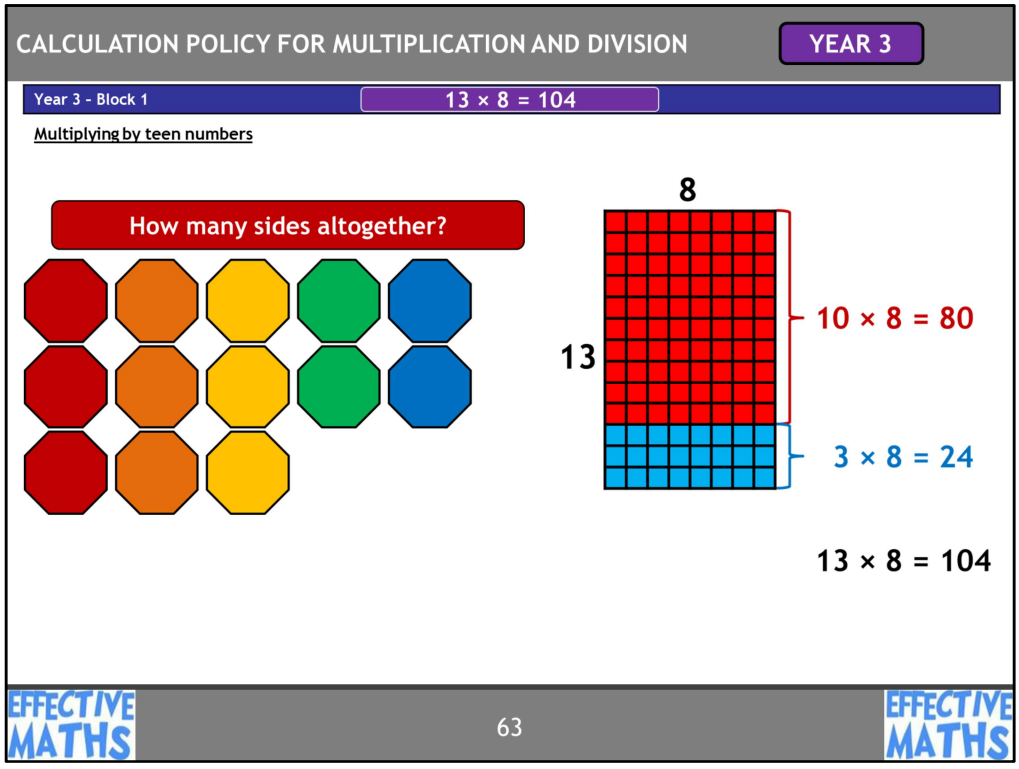
The final lesson of the unit focuses on dividing by 3. The concepts (sharing and grouping) and representations (arrays, relationship triangles and multiplication grids) should be familiar to the children.



BLOCK 1
FRACTIONS UNIT 1

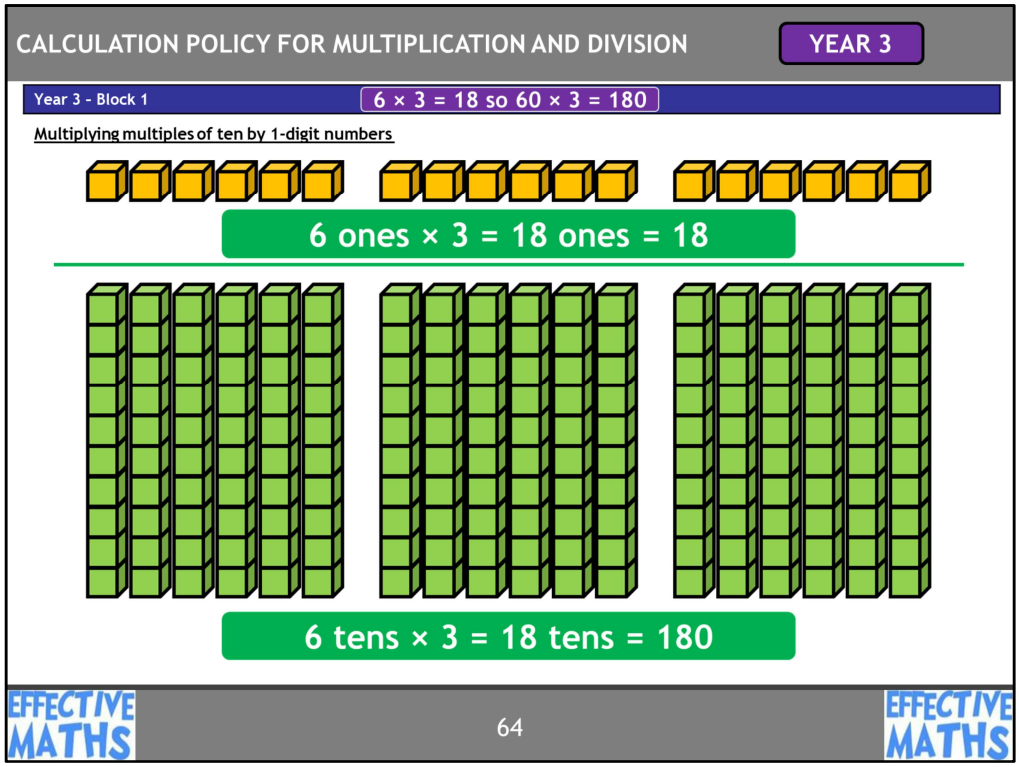
Finding unit fractions of quantities

Children have had lots of experience finding halves, thirds and quarters from Year 2 and earlier in the Year 3 fractions unit. That experience is now extended to finding fifths, eighths and tenths (linked to multiplication tables they should know/be learning). Teaching stresses the connection between a unit fraction of a quantity and dividing that quantity by the denominator.
Visual representations and careful use of language support understanding.
Learning progresses from describing situations where the value of a part is visible to situations where the value of a part cannot be seen.



BLOCK 1
× AND ÷ UNIT 2

Multiplying by teen numbers
Children have considerable experience of partitioning arrays to derive multiplication facts within the multiplication tables. This is now extended to derive facts beyond the multiplication tables, using facts from within them.



Multiplying multiples of ten by 1-digit numbers

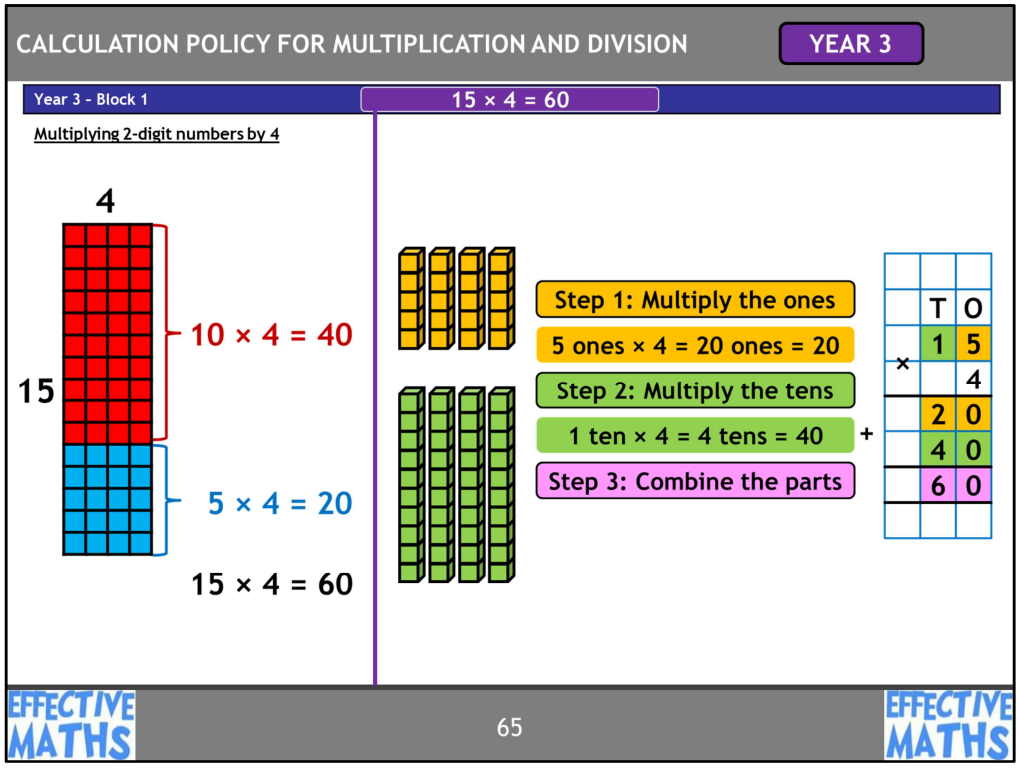
Scaling is used to derive new multiplication facts from known facts. For example:

6 × 3 = 18

60 × 3 = 6 tens × 3 = 18 tens = 180

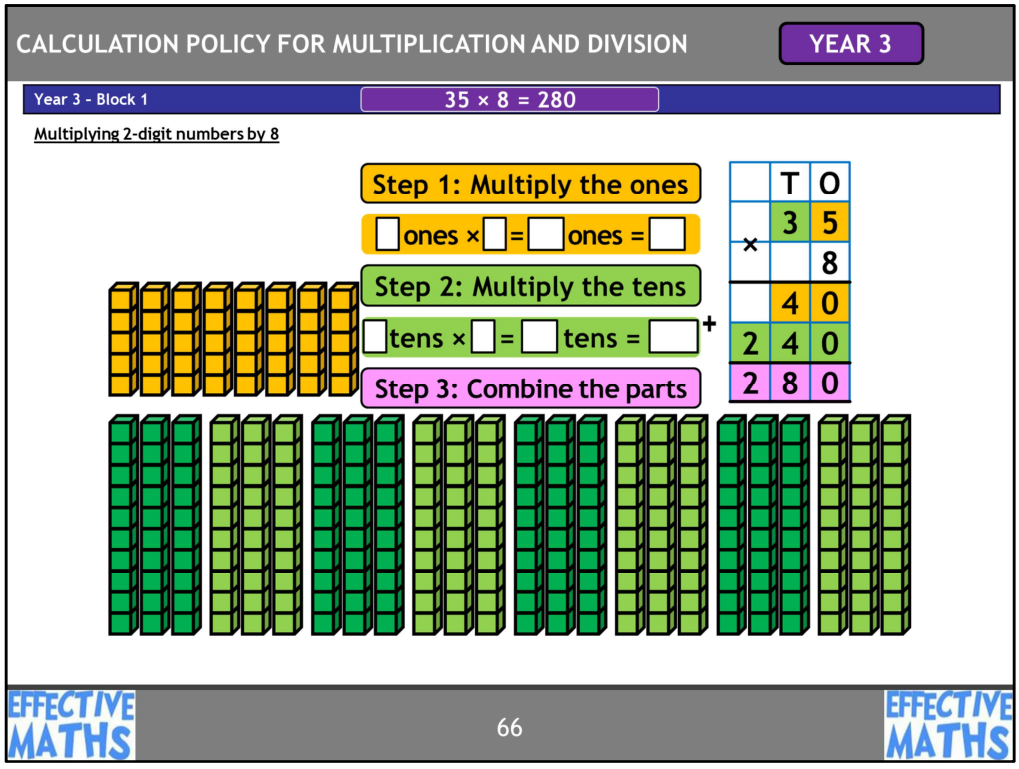
Base ten is used to support conceptual understanding.

As you say '18 tens' it is useful to write 180 (underlining the zero as you say 'tens'). Then read 18 tens/180 as one hundred and eighty/180.



Multiplying 2-digit numbers by 4

Learning from the previous two steps, multiplying teen numbers and multiplying multiples of ten, is used to introduce children to the expanded column method for multiplication. This is done by solving a calculation using a known method (partitioning an array), then solving the same calculation with base 10 blocks and finally using the expanded column method. Teaching makes connections between all three representations.



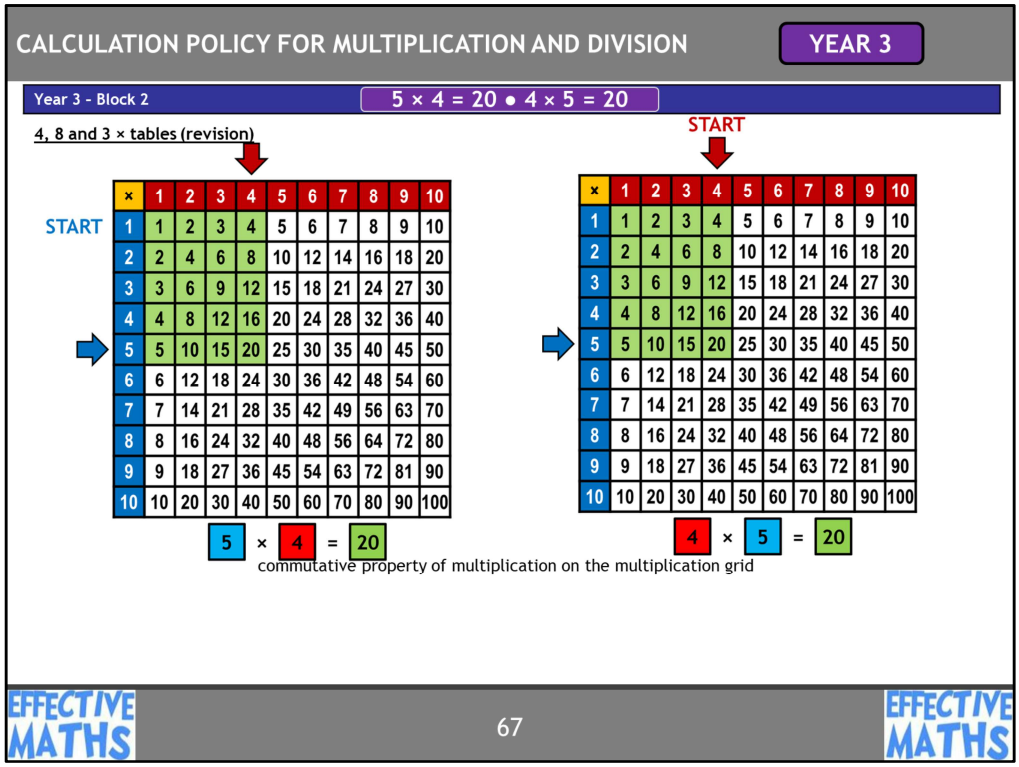
Multiplying 2-digit numbers by 8

Arrays continue to support understanding, but the emphasis moves more towards base 10 supporting understanding of the expanded column method.

Accurate use of language is key to ensuring conceptual understanding. For example:

5 ones × 8 = 40 ones = 40

3 tens × 8 = 24 tens = 240



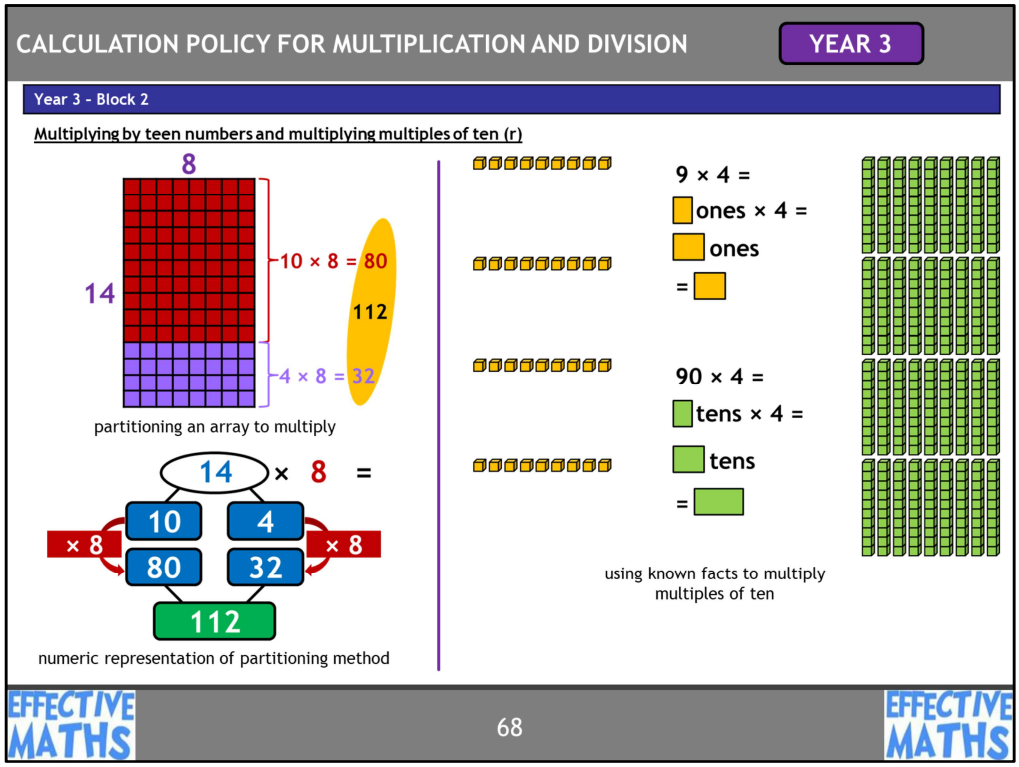
BLOCK 2
× AND ÷ UNIT 3

4, 8 and 3 × tables (revision)

× and ÷ Unit 3 begins with revision of the 4, 8 and 3 × tables. No new representations are encountered. Teaching stresses the commutative nature of multiplication and shows how we obtain the same product regardless of the order of the factors.

The multiplication grid may look a bit like a 100 square, but it works in a very different way. The multiplication grid is actually arrays. The first grid shows 5 rows of 4. The second shows 4 columns of 5.

Children continue to be exposed to the distributive property of multiplication (not referred to as such) to deepen understanding about multiplication. For example: 10 × 3 + 2 × 3 = 12 × 3.

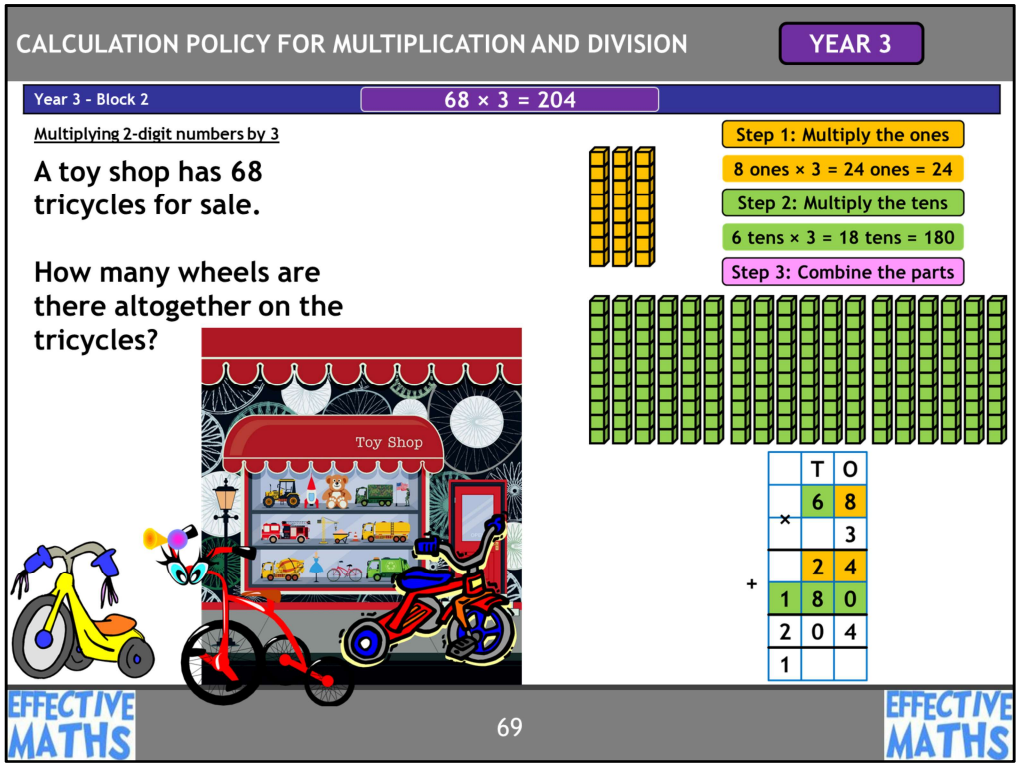


Multiplying by teen numbers and multiplying multiples of ten (r)

× and ÷ Unit 2 introduced multiplying by teen numbers: finding facts beyond the multiplication tables, using facts from within them. Arrays supported conceptual understanding.

Unit 3 introduces a numeric representation to support conceptual understanding of the partitioning method.

Children consolidate their understanding of multiplying multiples of ten.



Multiplying 2-digit numbers by 3

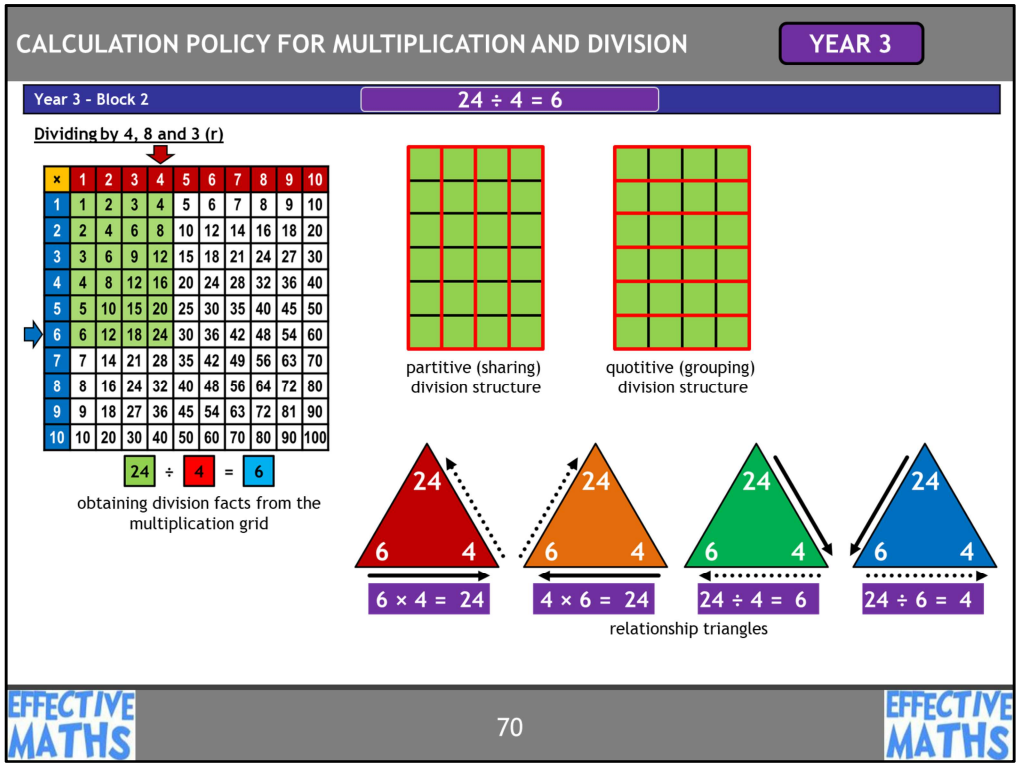
× and ÷ Unit 2 introduced the expanded column method to multiply 2-digit numbers by 4 and 8. (These are multiplication tables children typically have better recall of than the 3 × table.)

Multiplying 2-digit numbers by 3 is introduced in Unit 3. Base 10 supports understanding of the expanded column method.

Accurate use of language is key to ensuring conceptual understanding. For example:

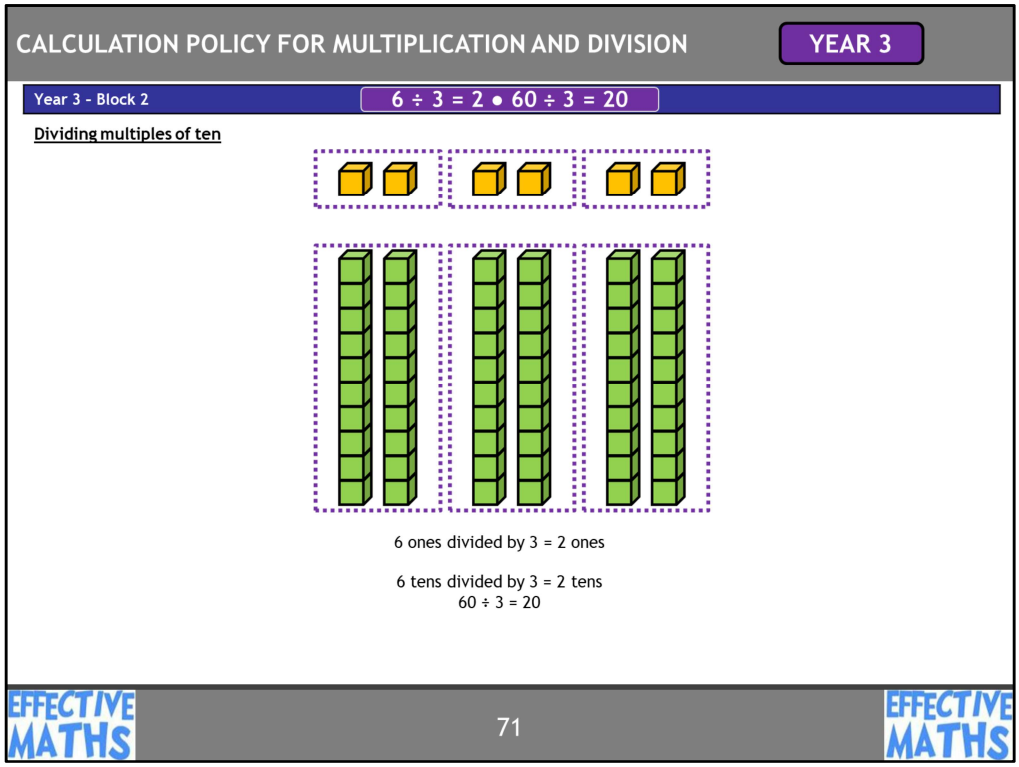
8 ones × 3 = 24 ones = 24

6 tens × 3 = 18 tens = 180



Dividing by 4, 8 and 3 (r)

The second half of the unit focuses on division and begins with revision of division facts linked to the 4, 8 and 3 × tables. Children are reminded how to use the multiplication grid to obtain division facts and about the sharing/grouping structures for division. Relationship triangles reinforce the connections between multiplication and division. Children solve problems involving division facts linked to the 4, 8 and 3 × tables.



Dividing multiples of ten

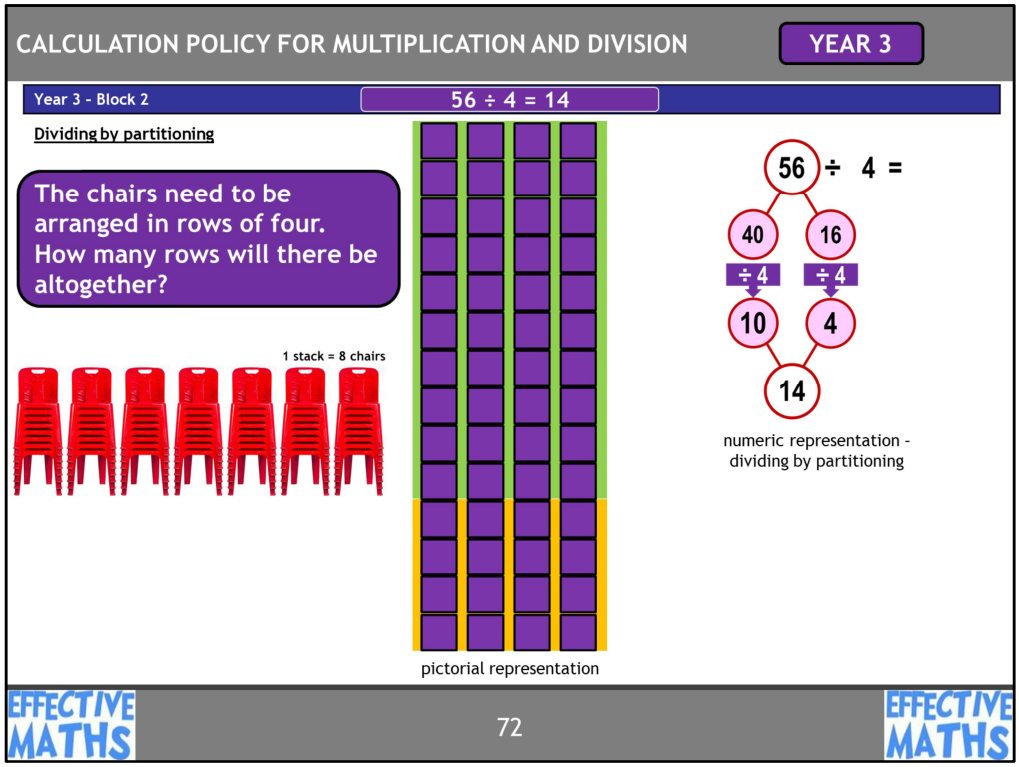
Children have experienced using known facts in unit 2 (and earlier in this unit) when they multiplied multiples of ten. They now use scaling for division facts derived from multiplication tables.

Use of language is key.

6 ones divided by 3 = 2 ones

6 tens divided by 3 = 2 tens

60 ÷ 3 = 20



Dividing by partitioning

Children's experience of division now extends to situations where the dividend is not in the multiplication tables they know. They learn to partition the dividend into multiples of the divisor. In the case of 56 ÷ 4 one way to partition 56 would be 40 and 16. Each part is then divided by 4 and the resulting quotients combined.

56 ÷ 4 =

40 ÷ 4 + 16 ÷ 4 =

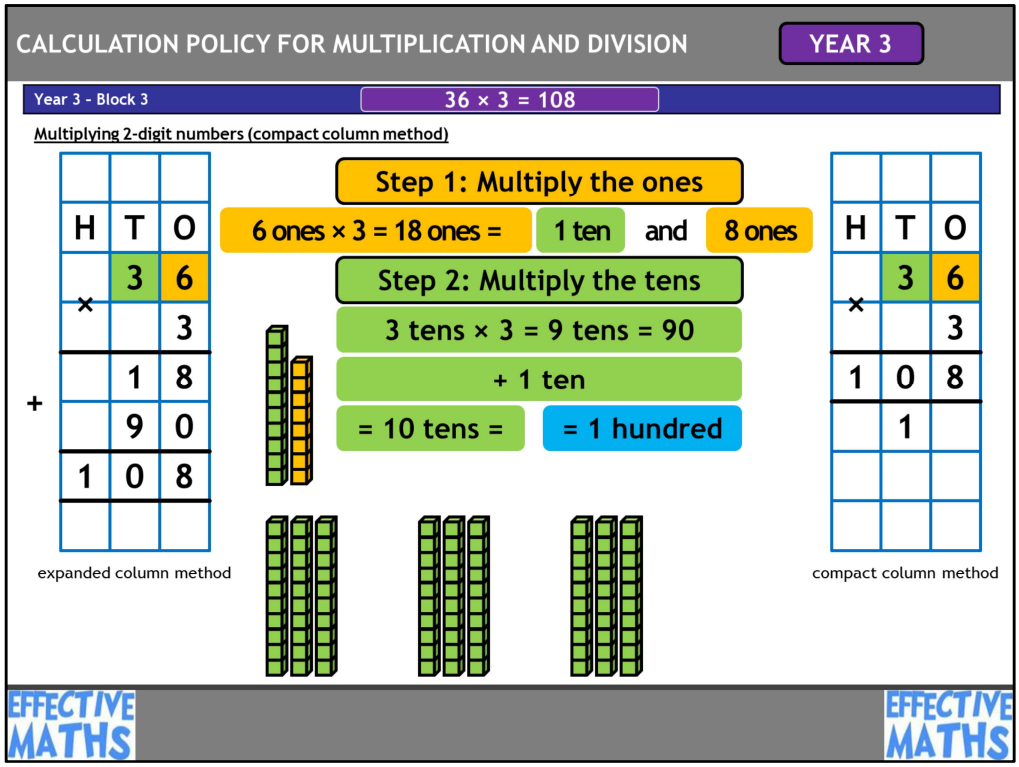
10 + 4 = 14

Clearly the dividend can be partitioned into any multiples of the divisor.

56 ÷ 4 =

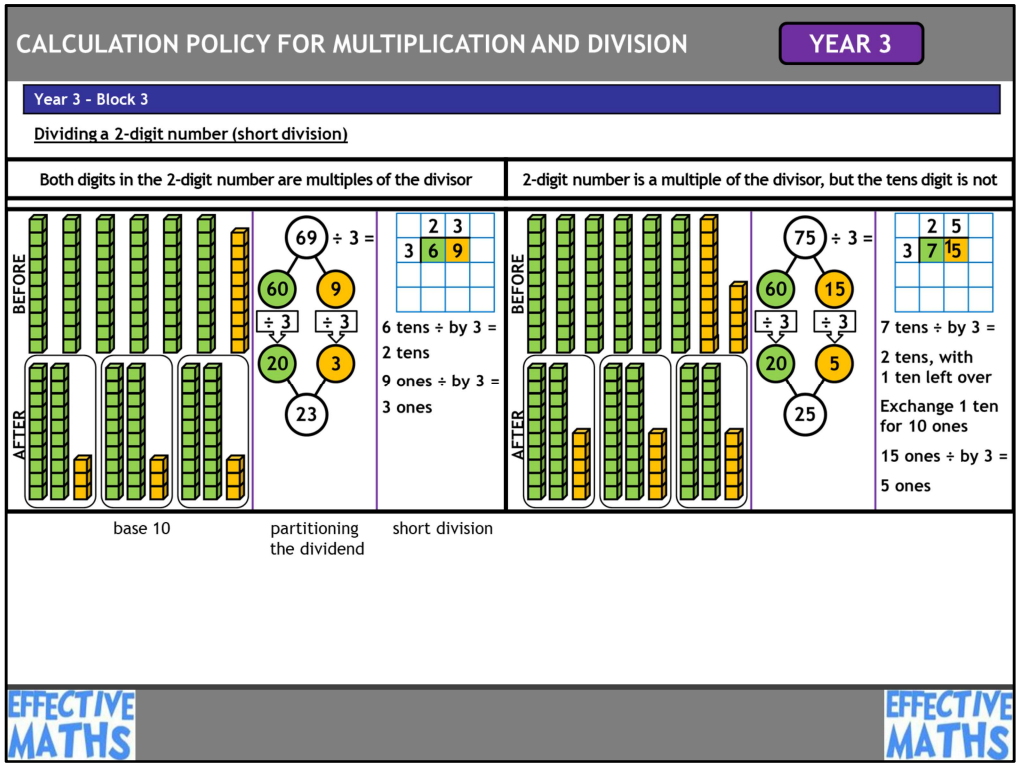
20 ÷ 4 + 36 ÷ 4 =

5 + 9 = 14



BLOCK 3
CALCULATION UNIT

Multiplying 2-digit numbers (compact column method)
Children have multiplied numbers by using partitioning, including representing this partitioning with the expanded column method. Arrays and base ten representations support conceptual understanding as the compact column method is introduced. The use of language is key to ensure conceptual understanding, particularly around the exchanging of ones for tens.
Language for 36 × 3
6 ones × 3 = 18 ones = 1 ten and 8 ones.
3 tens × 3 = 9 tens + the 1 ten = 10 tens = 1 hundred.



Dividing a 2-digit number (short division)

Children have experience of division facts linked to the multiplication tables they know and also of using partitioning to divide. They are now introduced to the formal algorithm for short division. The following sequence is followed:

- both digits in a 2-digit number are multiples of the divisor (eg 69 ÷ 3);
- 2-digit number is a multiple of the divisor, but the tens digit is not (eg 75 ÷ 3).

Base 10 and the partitioning method support conceptual understanding.

Using base 10 for 75 ÷ 3

Share the 6 of the tens equally between three groups.
You have one ten left over. It cannot be shared, so say:
Let's exchange 1 ten for 10 ones. Now we have 15 ones.
Share the 15 ones equally between the three groups.

Using partitioning for 75 ÷ 3

Partition 75 into parts that are divisible by 3, highlighting that those parts are 60 and 15 not 70 and 5.
Divide each part by 3.
Combine the parts to obtain 25.

Using short division for 75 ÷ 3

Write the dividend (75) and then draw the frame.
Write the divisor on the left of the dividend.
Say:
7 tens ÷ by 3 = 2 tens with 1 ten left over.
Exchange 1 ten for 10 ones.
15 ones divided by 3 = 5 ones

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	Block 2	Block 3
Calculation content	MULTIPLICATION AND DIVISION (UNIT 1) • 8 × table (r) • 6 × table • 9 × table • 7 × table • Dividing by 6 • Dividing by 9 • Dividing by 7 FRACTIONS (UNIT 1) • Finding unit fractions of quantities • Finding non-unit fractions of quantities MULTIPLICATION AND DIVISION (UNIT 2) • 6 × table (r) • Multiplying multiples of ten by 1-digit numbers • Column method for multiplying 2-digit numbers by a 1-digit number (expanded and compact - revision) • Multiplying 3 digit numbers (expanded method) • Division with remainders	MONEY AND DECIMALS (UNIT 1) • Multiplying decimals by ten • Dividing 2-digit numbers by ten • Dividing 1-digit and 2-digit numbers by ten • Multiplying and dividing 1 and 2 digit numbers by 100 MULTIPLICATION AND DIVISION (UNIT 3) • Column method for multiplying 3-digit numbers by a 1-digit number (expanded and compact) • Scaling division facts • Dividing 3-digit numbers (partitioning) • Dividing 3-digit numbers (short division - exchanging hundreds and tens) FRACTIONS (UNIT 2) n/a	CALCULATION UNIT • Multiplying 3 numbers • Scaling multiplication and division facts by 10 and 100 • Multiplying a 3-digit number by a 1-digit number (compact column method and partitioning) • Dividing 3-digit numbers (short division and partitioning) MONEY AND DECIMALS (UNIT 2) n/a

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION — YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	8 × table (r) Block 1 begins by revisiting the 8 × table along with consolidating understanding from earlier year groups. This includes understanding of the distributive property of multiplication, through partitioning arrays: 6 × 8 = 3 × 8 + 3 × 8. The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression. Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg: 6 × 8 = 48 8 × 6 = 48	Multiplying and dividing by ten Two representations support understanding of what happens to the digits when we multiply or divide by ten: • the place value chart; • the Gattegno chart. Children learn that when we multiply by ten each digit moves one place to the left on the place value chart and one row up on the Gattegno chart. They learn about the respective movements for dividing by ten. Multiplying and dividing 1- and 2- digit numbers by 100 The same representations (i.e. the place value chart and the Gattegno chart) support understanding of what happens to the digits when we multiply or divide by one hundred. Children learn that when we multiply by one hundred each digit moves two places to the left on the place value chart and two rows up on the Gattegno chart. They learn about the respective movements for dividing by one hundred.	Multiplying 3 numbers In Year 2 children learnt to add three 1-digit numbers and that the order they added them was not important because addition is commutative. By this stage in Year 4 they know that multiplication is also commutative and they learn to multiply three numbers. Arrays support conceptual understanding.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>6 × table</u> Learning about the 6 × table makes links to the 3 × table which children learnt in Year 3. Children encountered open arrays in Year 3 and are re-familiarised with the concept again. (In an open array, the squares or individual objects are not indicated within the interior of the array rectangle. An open array does not have to be drawn to scale.) They explore the pattern formed in the products of the 6 × table. <u>9 × table</u> Learning about the 9 × table makes links to the 3 × table which children learnt in Year 3 and revisited when they began to learn the 6 × table. Understanding of the distributive property of multiplication is reinforced through partitioned arrays. Children continue to find multiplication statements to interpret open arrays. They also explore the pattern formed in the products of the 9 × table.	<u>Column method for multiplying 3-digit numbers by a 1-digit number (expanded and compact)</u> In Unit 2 children used the compact column method to multiply 2-digit numbers and the expanded method to multiply 3-digit numbers. Now they learn to apply the compact method to the multiplication of 3-digit numbers. Accurate use of language is key to ensuring conceptual understanding. For example: *6 ones × 3 = 18 ones. 18 ones = 1 ten and 8 ones.* *2 tens × 3 = 6 tens plus 1 ten = 7 tens.* *3 hundreds × 3 = 9 hundreds.*	<u>Scaling multiplication and division facts by 10 and 100</u> Children have had considerable experience with scaling number facts by ten and some previous experience of scaling facts by one hundred. For example, known addition and subtraction facts were scaled by one hundred in + and - unit 1. Some work on scaling by one hundred for multiplicative facts occurred in earlier × and ÷ units. By the end of Year 4 children should have increasingly good recall of multiplication facts and the associated division facts. They now combine these facts with unitising in hundreds. They learn that in scenarios like 400 × 3 they can use an anchor fact, 4 × 3 = 12. Because one factor, 4, will be multiplied by 100, then the resulting product must also be multiplied by 100. 4 × 3 = 12 so 400 × 3 = 1,200 Accurate use of language is key to ensuring understanding. For example: 4 hundreds × 3 = 12 hundreds = 12<u>00</u> = 1,200

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	7 × table Learning about the 7 × table makes links to the 5 and 2 × tables which children learnt in Year 2. Understanding is reinforced through partitioned arrays, eg: 4 × 5 = 20 4 × 2 = 8 4 × 7 = 28 Children find multiplication statements to interpret open arrays. After children have been introduced to the 6, 9 and 7 multiplication tables teachers need to provide plenty of opportunities for these - and all the others - to be practised. When children commit multiplication table facts to memory, they do so using a verbal sound pattern to associate the 3 relevant numbers, for example, "seven threes make twenty-one". It is important to provide opportunities for pupils to verbalise each multiplication fact as part of the process of developing fluency. (DfE Ready to Progress guidance.) Read them as 'One three is three; two threes make six; three threes make nine' etc.	Scaling division facts Base ten representations support understanding that when there is the same multiplicative change to the dividend and the divisor the resulting quotient stays the same. Scaling can help us to arrive at a simpler calculation to support answering a more complex calculation. For example: 42 ÷ 7 is easier than 84 ÷ 14 which is easier than 168 ÷ 28.	Multiplying a 3-digit number by a 1-digit number (compact column method and partitioning) Children consolidate understanding of the compact column method and revisit partitioning to secure multiplication of numbers with up to 3 digits. They do this within a problem solving approach and identify relationships between calculations. Dividing 3-digit numbers (short division and partitioning) Children consolidate understanding of the short division and revisit partitioning to secure division of numbers with up to 3 digits. They do this within a problem solving approach and identify relationships between calculations.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by 6</u> Children continue to use language about division that was introduced in Year 3, (dividend, divisor and quotient). In Year 2 and Year 3 children encountered two division structures, sharing and grouping. This continues in Year 4 and they interpret diagrams using both structures. Children should be very familiar with the relationship triangle and these are used to promote links between multiplication facts and division facts. Teaching builds on work from Year 3 using the multiplication grid to find division facts.	<u>Dividing by partitioning and using short division</u> Children have used both methods previously. They are now applied to situations where the dividend is a 3-digit number. Initial examples partition the dividend in a standard way. For example, 927 is partitioned into 900 and 27 when being divided by 9. Later examples partition the dividend in a non-standard way, prioritising partitioning into multiples of the divisor. For example, 891 is partitioned into 810 and 81 when being divided by 9. Teaching makes connections between the methods.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Dividing by 9 Learning to divide by 9 continues to develop understanding of the sharing and grouping structures. Children use the multiplication grid to derive division facts and interpret bar models. Dividing by 7 The final lesson of the unit focuses on dividing by 7. The concepts (sharing and grouping) and representations (arrays, relationship triangles and multiplication grids) should be familiar to the children. They solve problems involving the inverse.		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Finding unit fractions of quantities</u> Children have experience of finding halves, thirds, quarters, fifths, eighths and tenths linked to multiplication tables encountered in Year 2 and Year 3. Teaching stresses the connection between a unit fraction of a quantity and dividing that quantity by the denominator. That experience is now extended to finding sixths, sevenths and ninths (linked to multiplication tables they should know/be learning). Visual representations and careful use of language support understanding. Learning progresses from describing situations where the value of a part is visible to situations the value of a part cannot be seen. <u>Finding non-unit fractions of quantities</u> Learning now moves on to finding non-unit fractions of quantities. Teaching models using division to find the unit fraction and then multiplication to find multiples of the unit fraction.		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Multiplying multiples of ten by 1-digit numbers (r) Understanding about using scaling to derive new multiplication facts from known facts is consolidated. For example: 5 × 6 = 30 50 × 6 = 5 tens × 6 = 30 tens = 300 Base ten is used to support conceptual understanding. As you say '30 tens' it is useful to write 300 (underlining the zero as you say 'tens'). Then read 30 tens/300 as three hundred/300. Column method for multiplying 2-digit numbers by a 1-digit number (r) Multiplying a 2-digit number is revised (from Y3) prior to moving on to using the expanded method to multiply a 3-digit number. Accurate use of language is key to ensuring conceptual understanding. For example: 6 ones × 3 = 18 ones 18 ones = 1 ten and 8 ones Connections are made between the expanded column method and the compact column method.		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

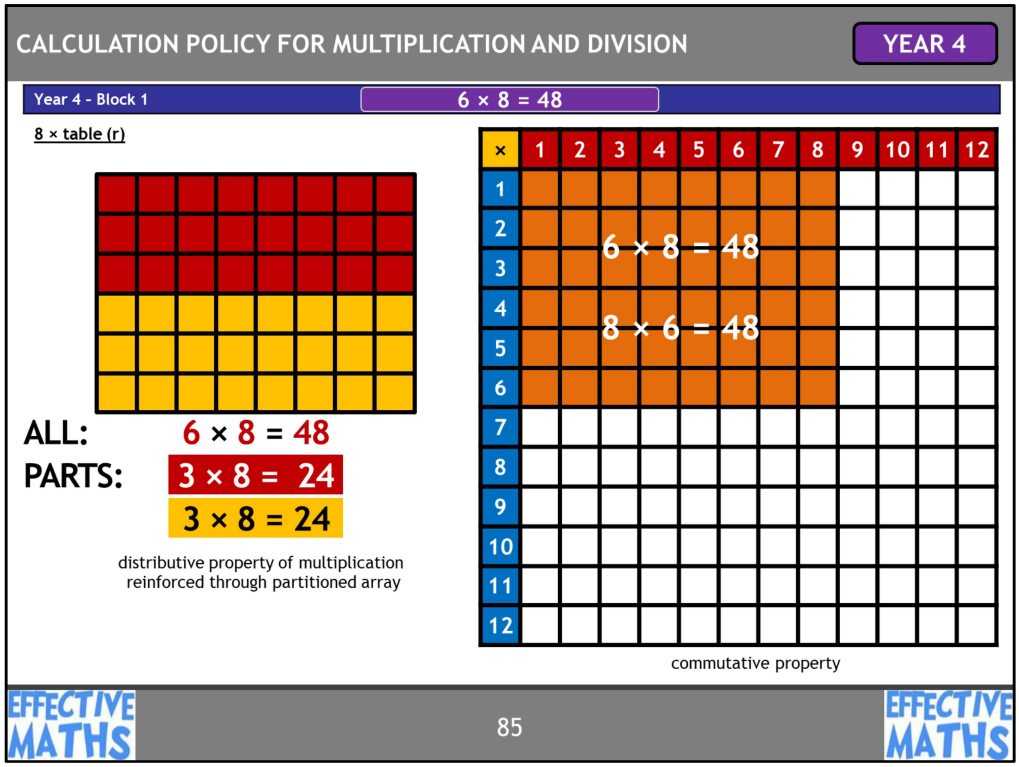
YEAR 4

Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Multiplying 3-digit numbers (expanded method)</u> Multiplying a 3-digit number by a 1-digit number is learnt using a method children already know - the expanded column method. The only thing different is there are now three digits. Accurate use of language remains key. For example: *6 ones × 4 = 24 ones. 24 ones = 2 tens and 4 ones.* *4 tens × 4 = 16 tens. 16 tens = 1 hundred and 6 tens.*		

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 4

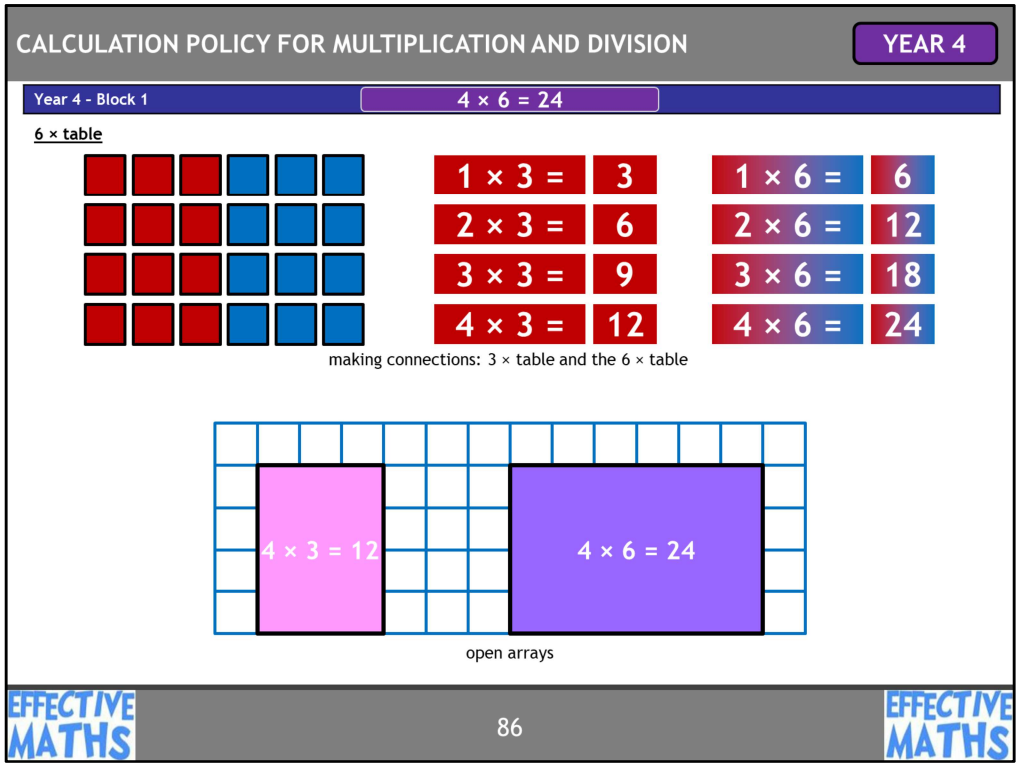
Year 4			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Division with remainders</u> Until this point, all work on division has resulted in quotients that are whole numbers, i.e. there have been no remainders. Teaching now helps children recognise that a remainder arises when there is something 'left over' in a division calculation. Children need to recognise and understand why remainders only occur when the dividend is not a multiple of the divisor. This can be achieved by discussing the patterns seen when the dividend is incrementally increased by 1 while the divisor is kept the same. Teaching stresses the following points. • If the dividend is a multiple of the divisor there is no remainder. • If the dividend is not a multiple of the divisor, there is a remainder. • The remainder is always less than the divisor.		



BLOCK 1
× AND ÷ UNIT 1

8 × table (r)
Block 1 begins by revisiting the 8 × table along with consolidating understanding from earlier year groups. This includes understanding of the distributive property of multiplication, through partitioning arrays:
6 × 8 = **3** × 8 + **3** × 8.
The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression.

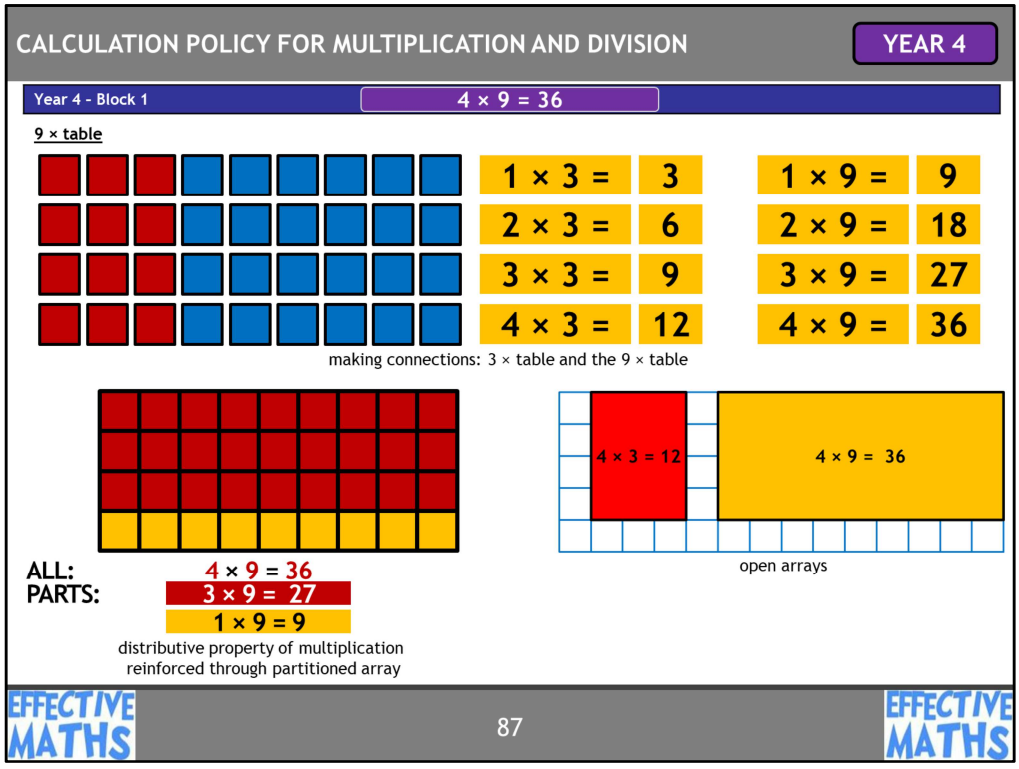
Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg:
6 × 8 = 48
8 × 6 = 48



6 × table

Learning about the 6 × table makes links to the 3 × table which children learnt in Year 3. Children encountered open arrays in Year 3 and are re-familiarised with the concept again. (In an open array, the squares or individual objects are not indicated within the interior of the array rectangle. An open array does not have to be drawn to scale.)

They explore the pattern formed in the products of the 6 × table.



9 × table

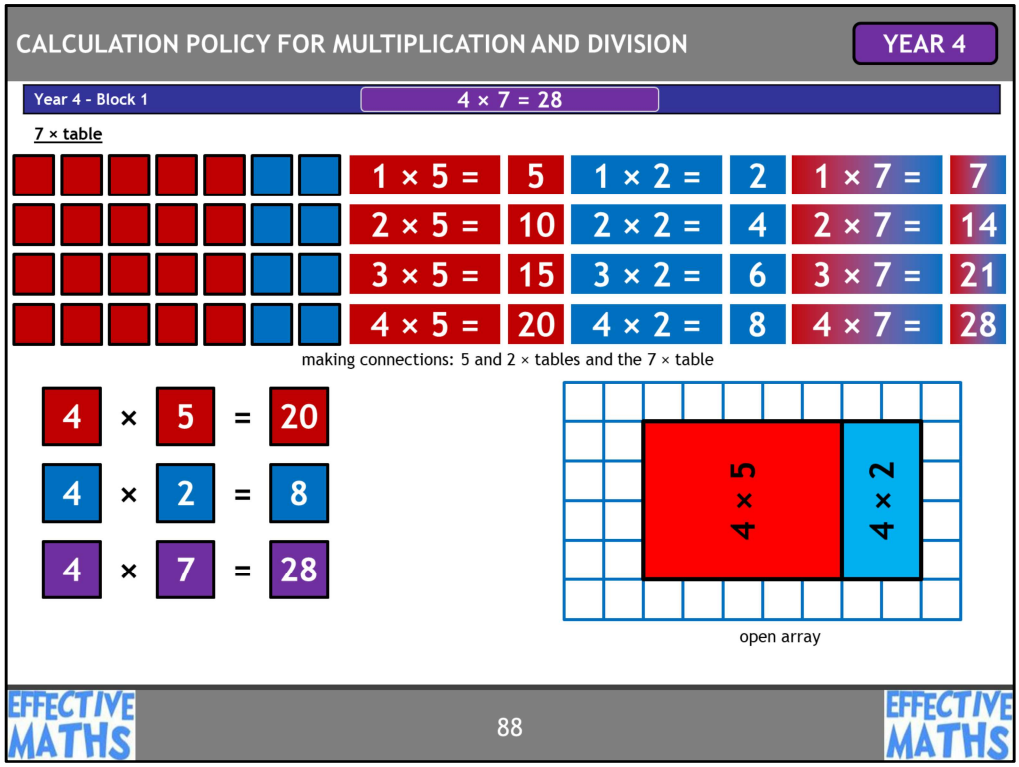
Learning about the 9 × table makes links to the 3 × table which children learnt in Year 3 and revisited when they began to learn the 6 × table. Understanding of the distributive property of multiplication is reinforced through partitioned arrays, eg:

4 × 9 = 36

3 × 9 = 27

1 × 9 = 9

Children find multiplication statements to interpret open arrays. They also explore the pattern formed in the products of the 9 × table.



7 × table

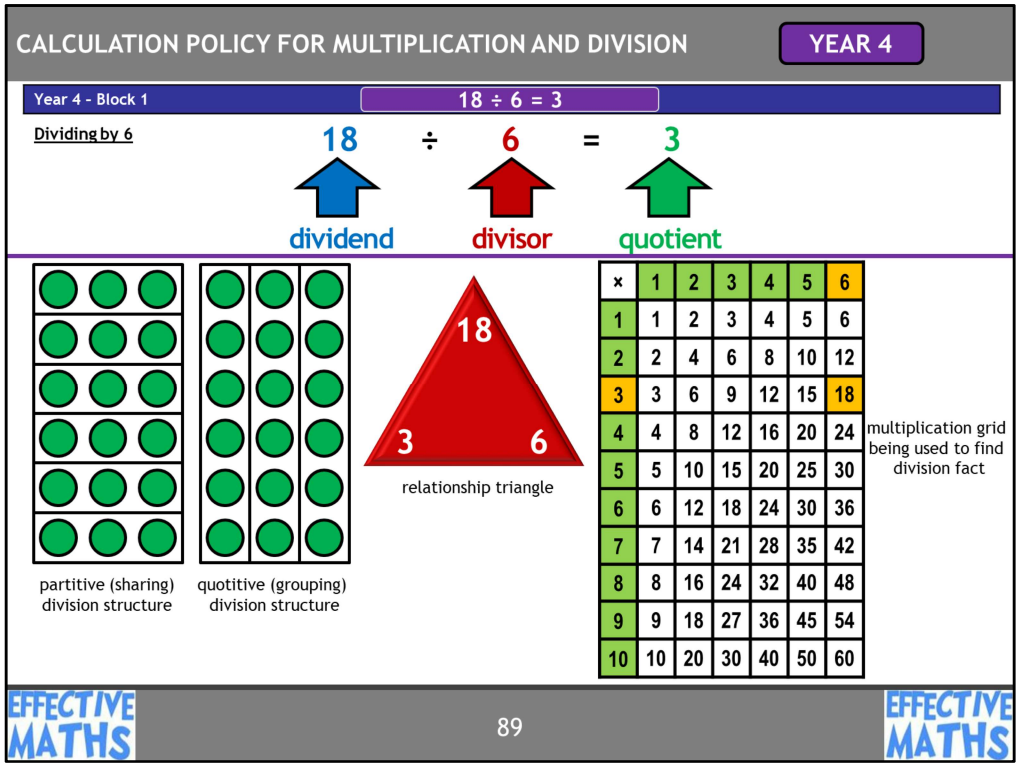
Learning about the 7 × table makes links to the 5 and 2 × tables which children learnt in Year 2. Understanding is reinforced through partitioned arrays, eg:

4 × 5 = 20
4 × 2 = 8
4 × 7 = 28

Children find multiplication statements to interpret open arrays.

After children have been introduced to the 6, 9 and 7 multiplication tables teachers need to provide plenty of opportunities for these – and all the others - to be practised.

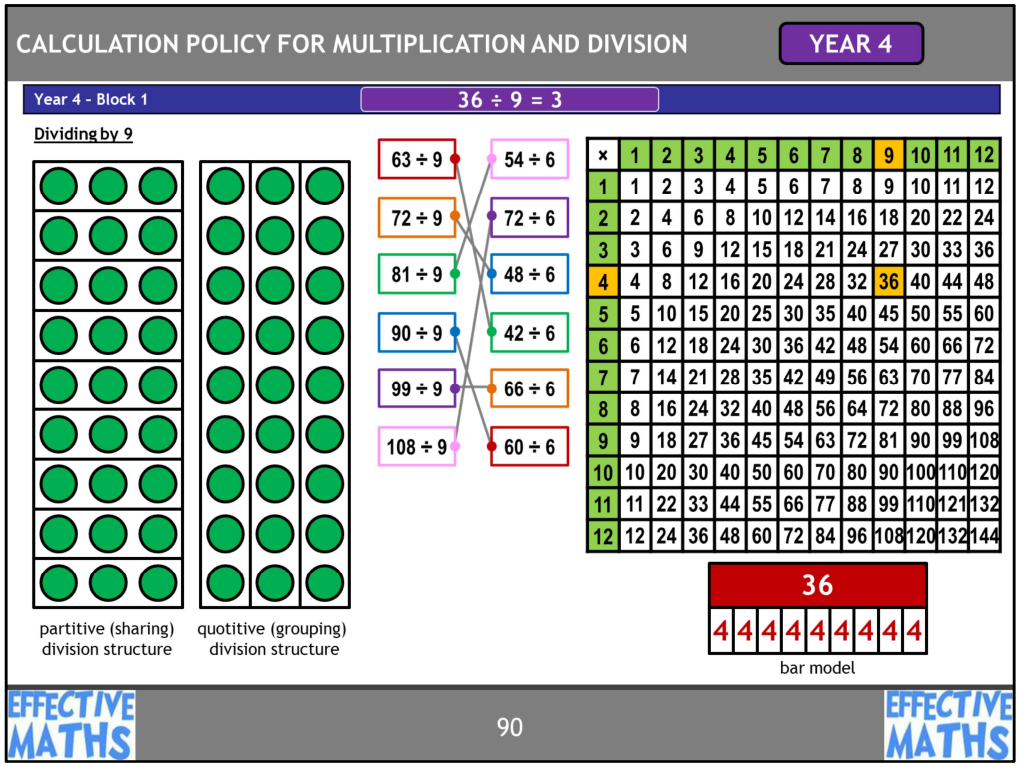
When children commit multiplication table facts to memory, they do so using a verbal sound pattern to associate the 3 relevant numbers, for example, “seven threes make twenty-one”. It is important to provide opportunities for pupils to verbalise each multiplication fact as part of the process of developing fluency. (DfE Ready to Progress guidance.) Read them as ‘One three is three; two threes make six; three threes make nine’ etc.



×	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36
7	7	14	21	28	35	42
8	8	16	24	32	40	48
9	9	18	27	36	45	54
10	10	20	30	40	50	60

Dividing by 6

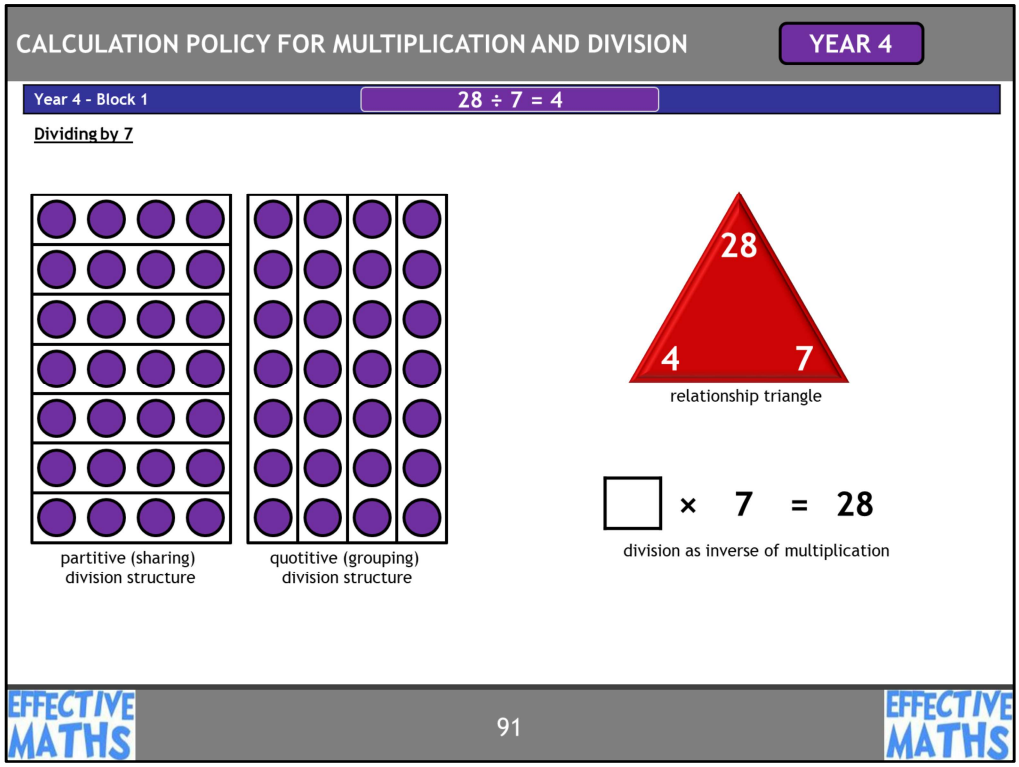
Children continue to use language about division that was introduced in Year 3, (dividend, divisor and quotient). In Year 2 and Year 3 children encountered two division structures, sharing and grouping. This continues in Year 4 and they interpret diagrams using both structures. Children should be very familiar with the relationship triangle and these are used to promote links between multiplication facts and division facts. Teaching builds on work from Year 3 using the multiplication grid to find division facts.



×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Dividing by 9

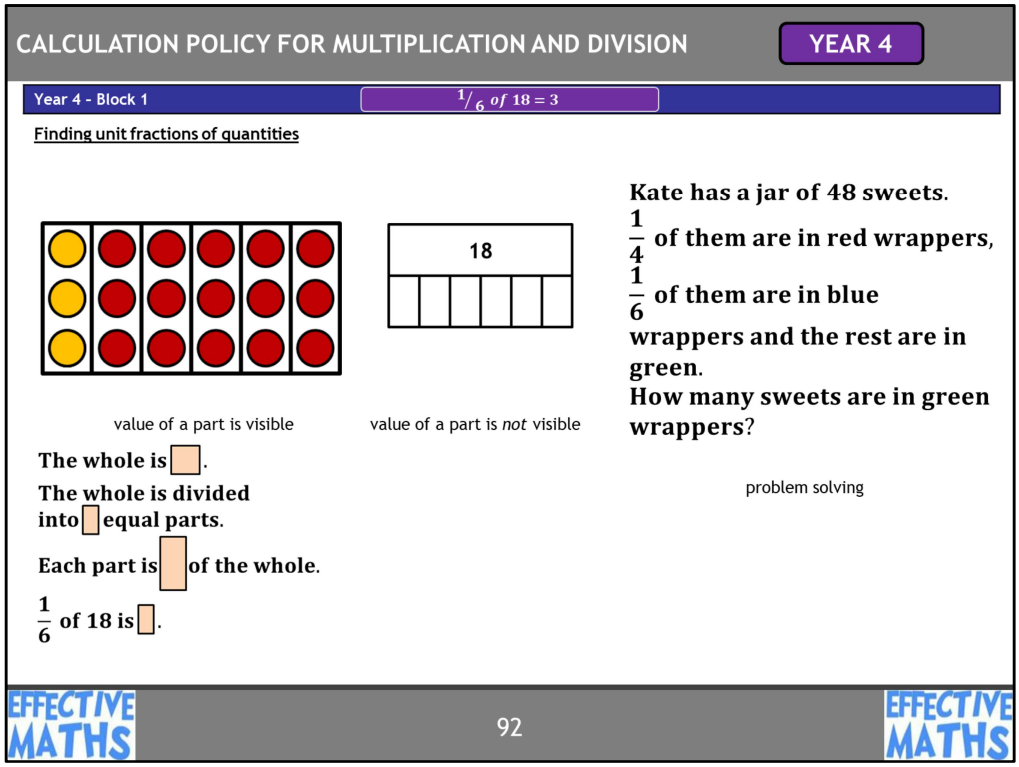
Learning to divide by 9 continues to develop understanding of the sharing and grouping structures. Children use the multiplication grid to derive division facts and interpret bar models.



Dividing by 7

The final lesson of the unit focuses on dividing by 7. The concepts (sharing and grouping) and representations (arrays, relationship triangles and multiplication grids) should be familiar to the children.

They solve problems involving the inverse.



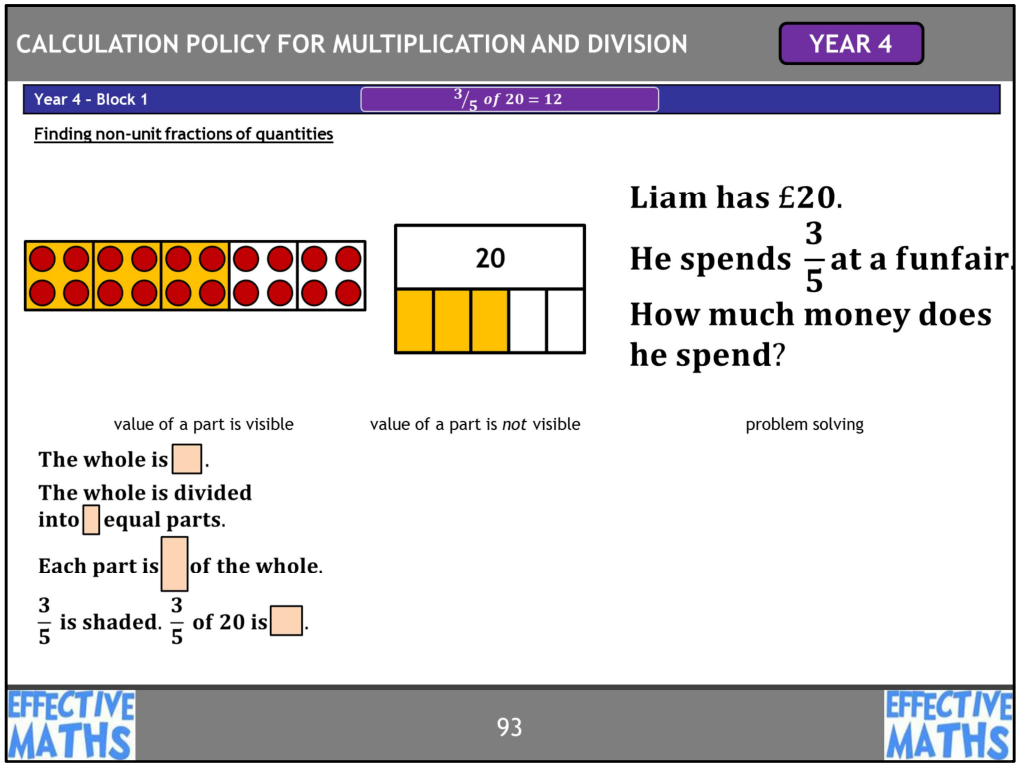
BLOCK 1
FRACTIONS UNIT 1

Finding unit fractions of quantities

Children have experience of finding halves, thirds, quarters, fifths, eighths and tenths linked to multiplication tables encountered in Year 2 and Year 3. That experience is now extended to finding sixths, sevenths and ninths (linked to multiplication tables they should know/be learning). Teaching stresses the connection between a unit fraction of a quantity and dividing that quantity by the denominator.

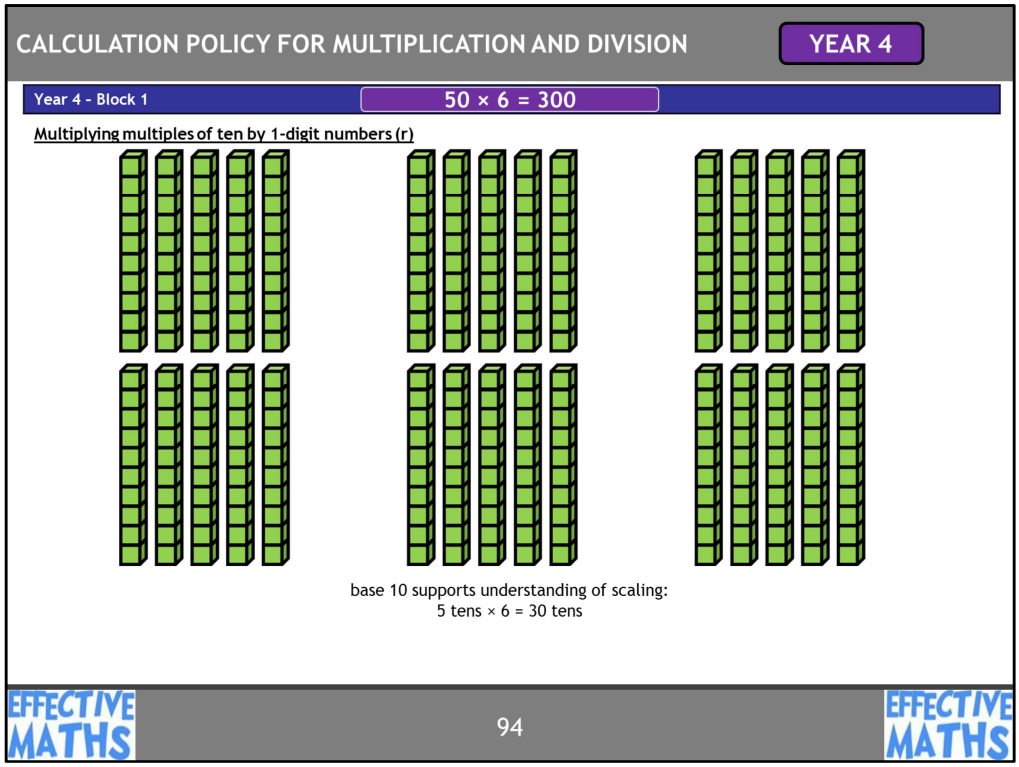
Visual representations and careful use of language support understanding.

Learning progresses from describing situations where the value of a part is visible to situations the value of a part cannot be seen.



Finding non-unit fractions of quantities

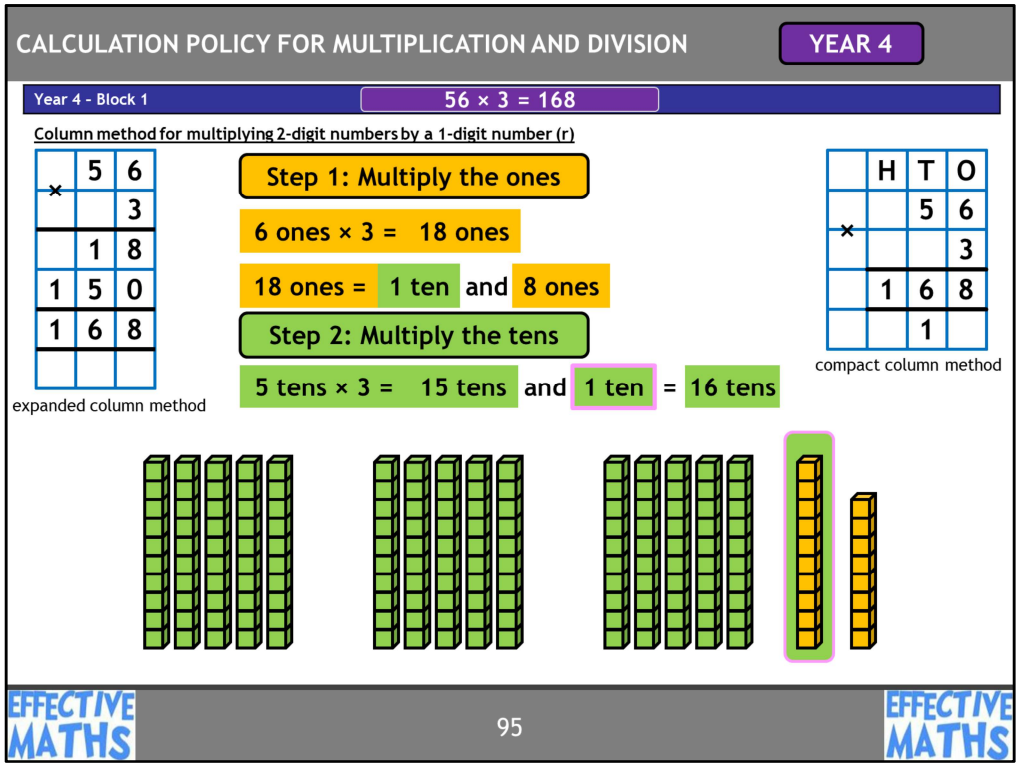
Learning now moves on to finding non-unit fractions of quantities. Teaching models using division to find the unit fraction and then multiplication to find multiples of the unit fraction.
The non-unit fractions used have denominators linked to multiplication tables that children should be very familiar with (halves, thirds, quarters, fifths, eighths and tenths).



BLOCK 1
× AND ÷ UNIT 2

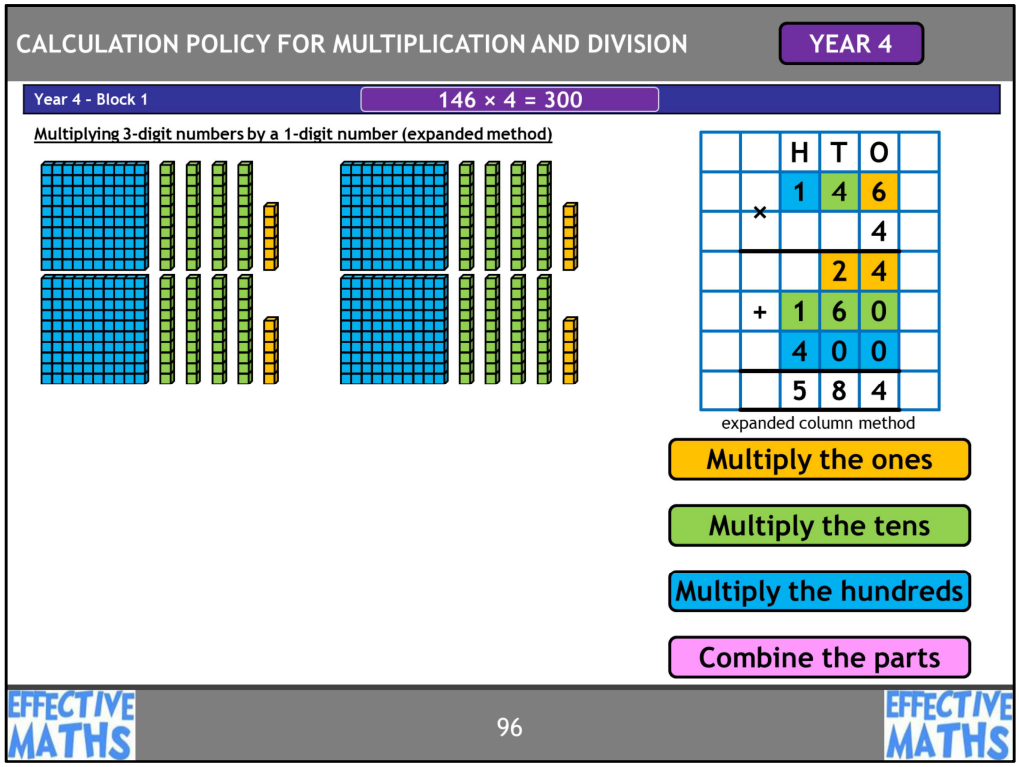
Unit 2 begins by revising the 6 × table through the context of partitioned arrays and

Multiplying multiples of ten by 1-digit numbers (r)
Understanding about using scaling to derive new multiplication facts from known facts is consolidated. For example:
5 × 6 = 30
50 × 6 = 5 tens × 6 = 30 tens = 300
Base ten is used to support conceptual understanding.
As you say '30 tens' it is useful to write 30<u>0</u> (underlining the zero as you say 'tens'). Then read 30 tens/30<u>0</u> as three hundred/300.



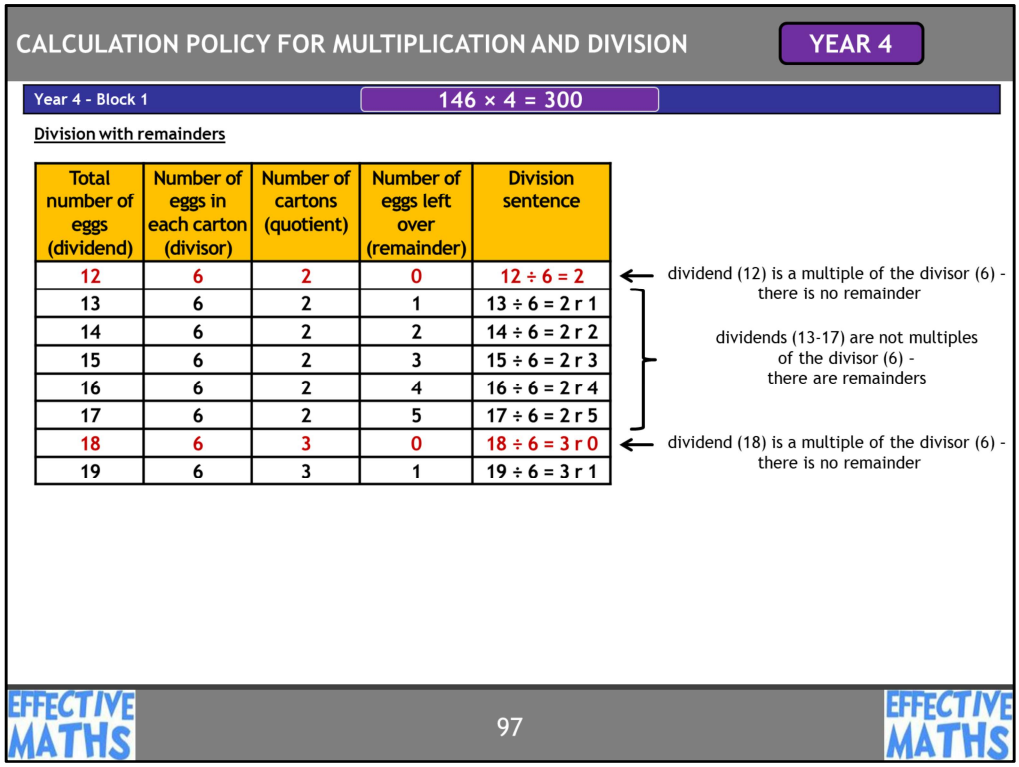
Column method for multiplying 2-digit numbers by a 1-digit number (r)

Multiplying a 2-digit number is revised (from Year 3) prior to moving on to using the expanded method to multiply a 3-digit number.
Accurate use of language is key to ensuring conceptual understanding. For example:
6 ones × 3 = 18 ones
18 ones = 1 ten and 8 ones
Connections are made between the expanded column method and the compact column method.



Multiplying 3-digit numbers (expanded method)

Multiplying a 3-digit number by a 1-digit number is learnt using a method children already know – the expanded column method. The only thing different is there are now three digits.
Accurate use of language remains key. For example:
6 ones × 4 = 24 ones. 24 ones = 2 tens and 4 ones.
4 tens × 4 = 16 tens. 16 tens = 1 hundred and 6 tens.



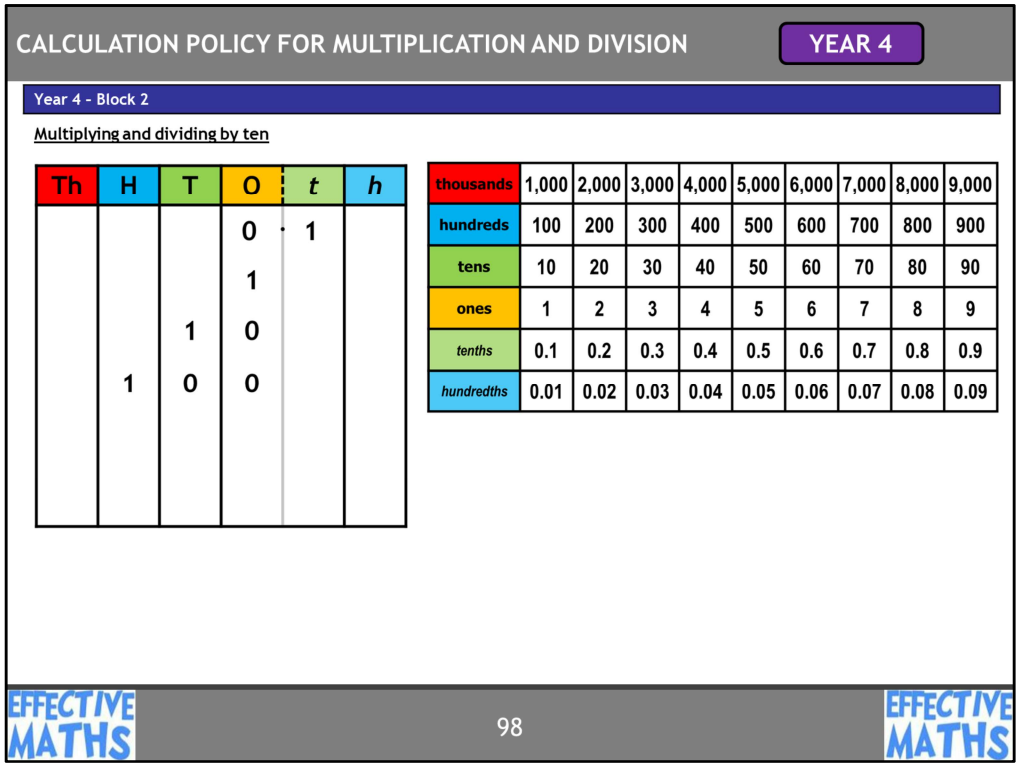
Division with remainders

Until this point, all work on division has resulted in quotients that are whole numbers, i.e. there have been no remainders.

Teaching now helps children recognise that a remainder arises when there is something 'left over' in a division calculation. Children need to recognise and understand why remainders only occur when the dividend is not a multiple of the divisor. This can be achieved by discussing the patterns seen when the dividend is incrementally increased by 1 while the divisor is kept the same.

Teaching stresses the following points.

- If the dividend is a multiple of the divisor there is no remainder.
- If the dividend is not a multiple of the divisor, there is a remainder.
- The remainder is always less than the divisor.



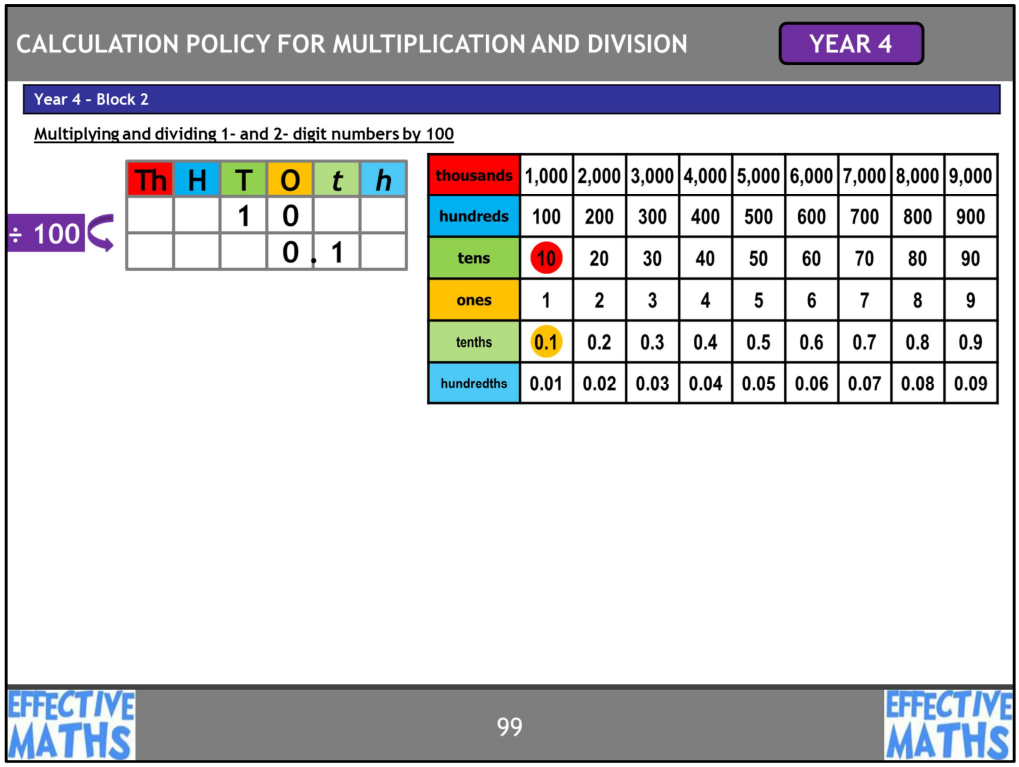
BLOCK 2
MONEY AND DECIMALS UNIT 1

Multiplying and dividing by ten

Two representations support understanding of what happens to the digits when we multiply or divide by ten:

- the place value chart;
- the Gattegno chart.

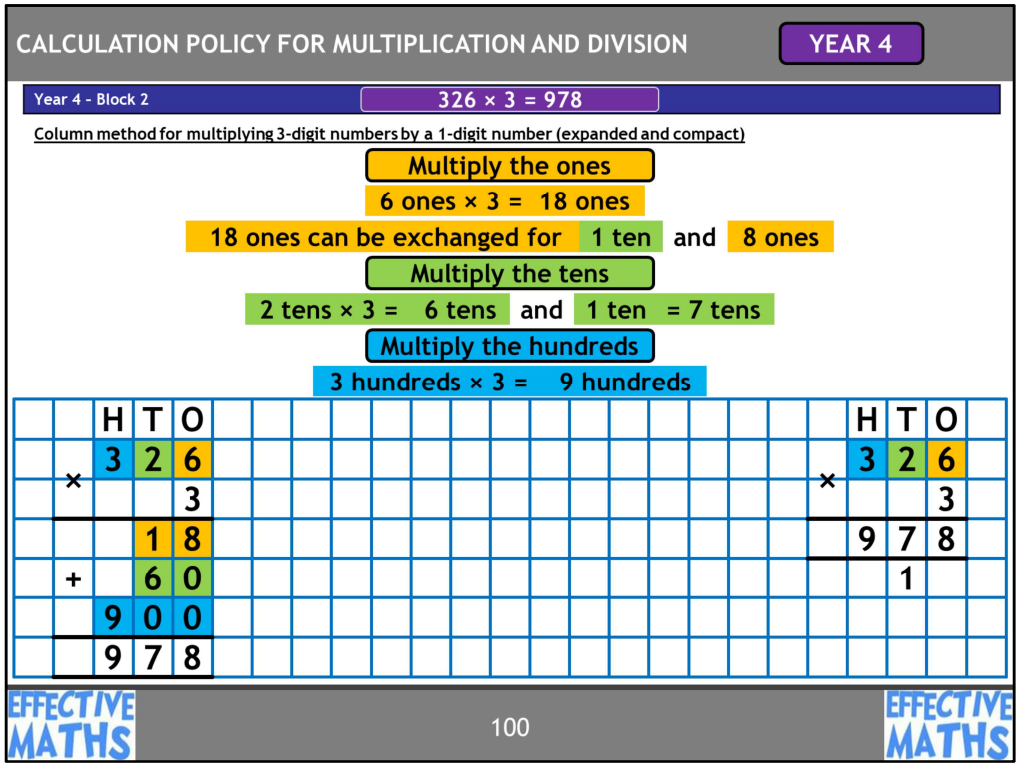
Children learn that when we multiply by ten each digit moves one pace to the left on the place value chart and one row up on the Gattegno chart. They learn about the respective movements for dividing by ten.



Multiplying and dividing 1- and 2- digit numbers by 100

The same representations (i.e. the place value chart and the Gattegno chart) support understanding of what happens to the digits when we multiply or divide by one hundred.

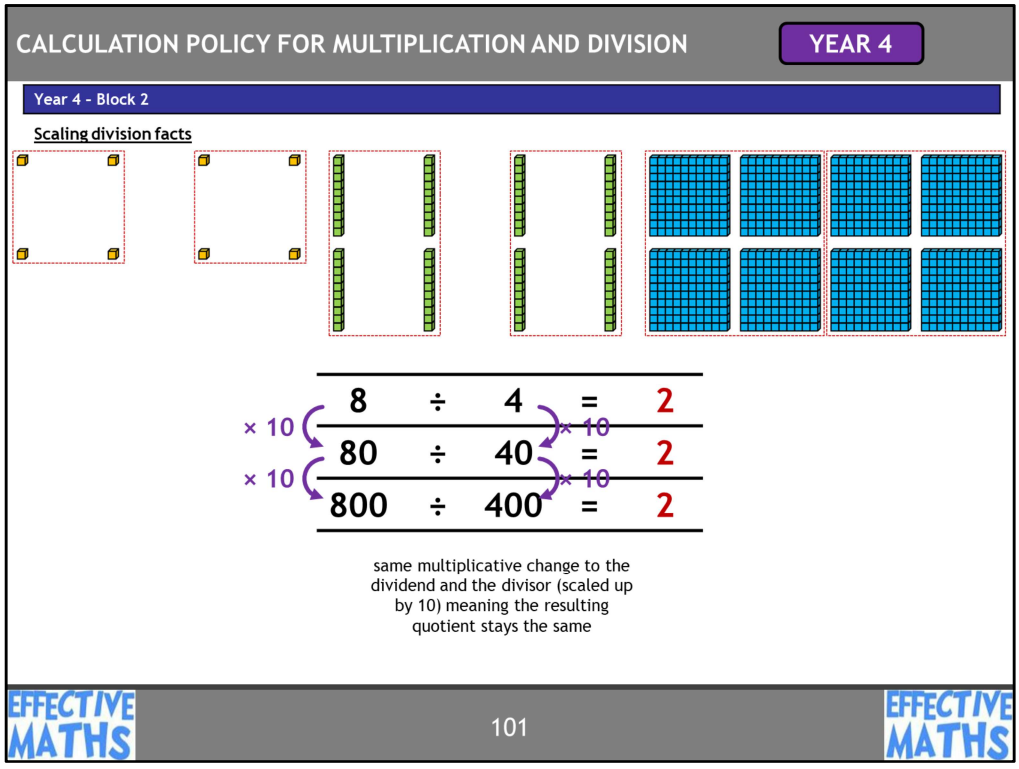
Children learn that when we multiply by one hundred each digit moves two places to the left on the place value chart and two rows up on the Gattegno chart. They learn about the respective movements for dividing by one hundred.



BLOCK 2
× and ÷ UNIT 3

Column method for multiplying 3-digit numbers by a 1-digit number (expanded and compact)

In Unit 2 children used the compact column method to multiply 2-digit numbers and the expanded method to multiply 3-digit numbers. Now they learn to apply the compact method to the multiplication of 3-digit numbers.
Accurate use of language is key to ensuring conceptual understanding. For example:
6 ones × 3 = 18 ones. 18 ones = 1 ten and 8 ones.
2 tens × 3 = 6 tens plus 1 ten = 7 tens.
3 hundreds × 3 = 9 hundreds.



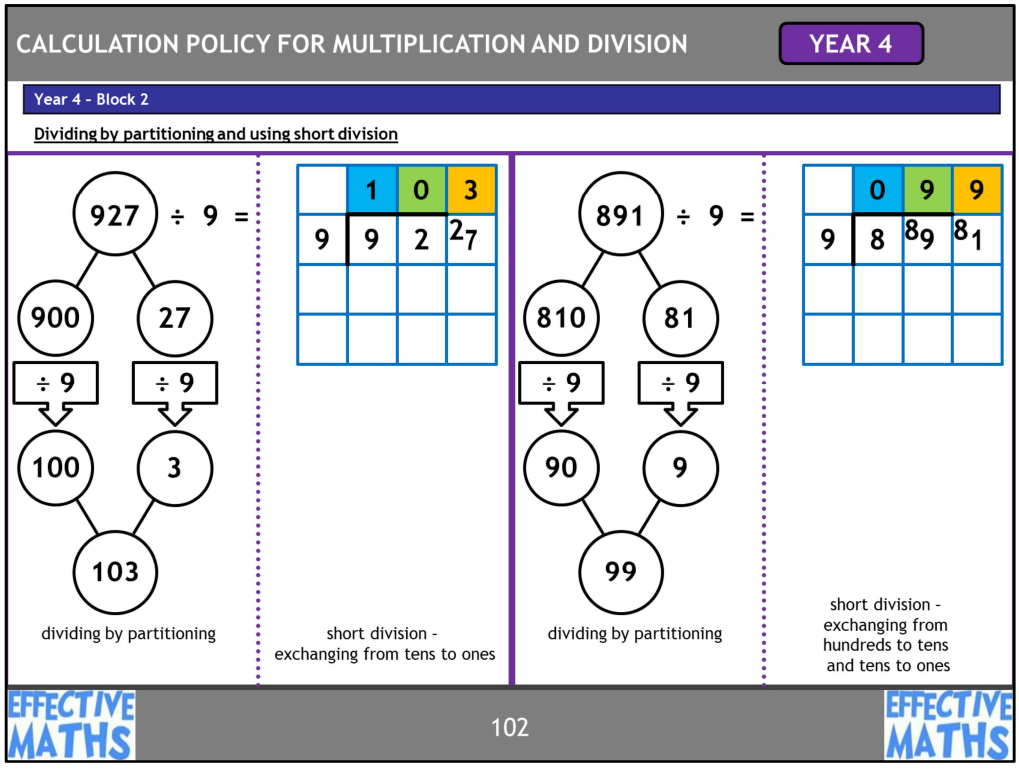
Scaling division facts

Base ten representations support understanding that when there is the same multiplicative change to the dividend and the divisor the resulting quotient stays the same. Scaling can help us to arrive at a simpler calculation to support answering a more complex calculation. For example:

42 ÷ 7 is easier than

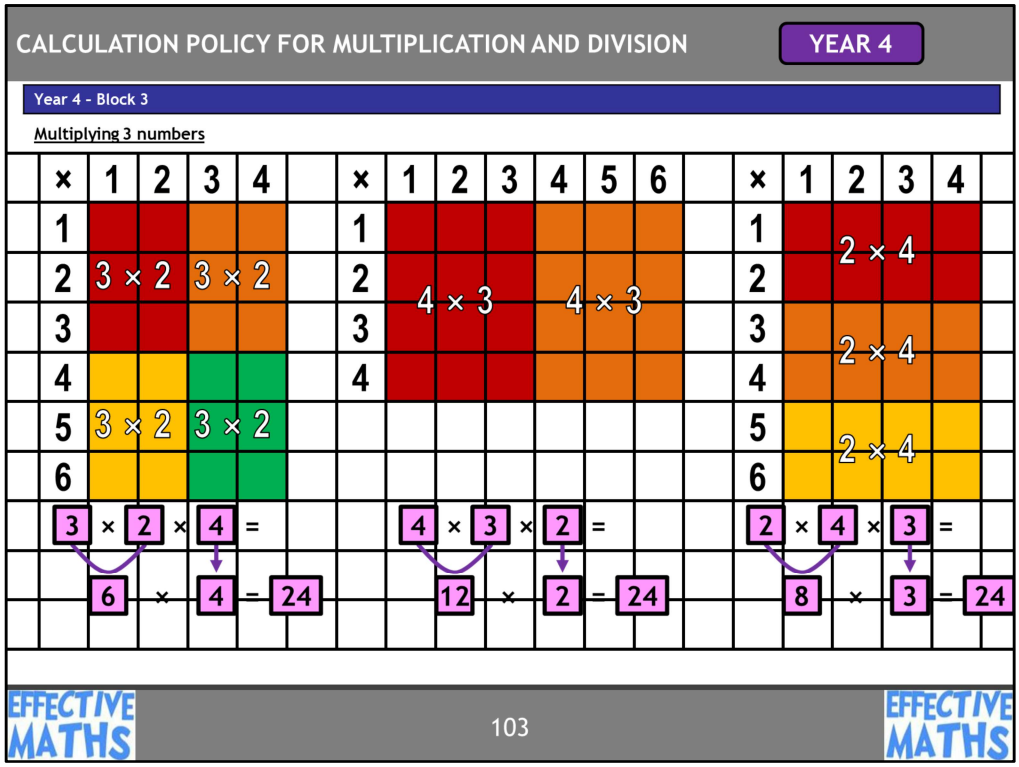
84 ÷ 14 which is easier than

168 ÷ 28.



Dividing by partitioning and using short division

Children have used both methods previously. They are now applied to situations where the dividend is a 3-digit number. Initial examples partition the dividend in a standard way. For example, 927 is partitioned into 900 and 27 when being divided by 9. Later examples partition the dividend in a non-standard way, prioritising partitioning into multiples of the divisor. For example, 891 is partitioned into 810 and 81 when being divided by 9. Teaching makes connections between the methods.

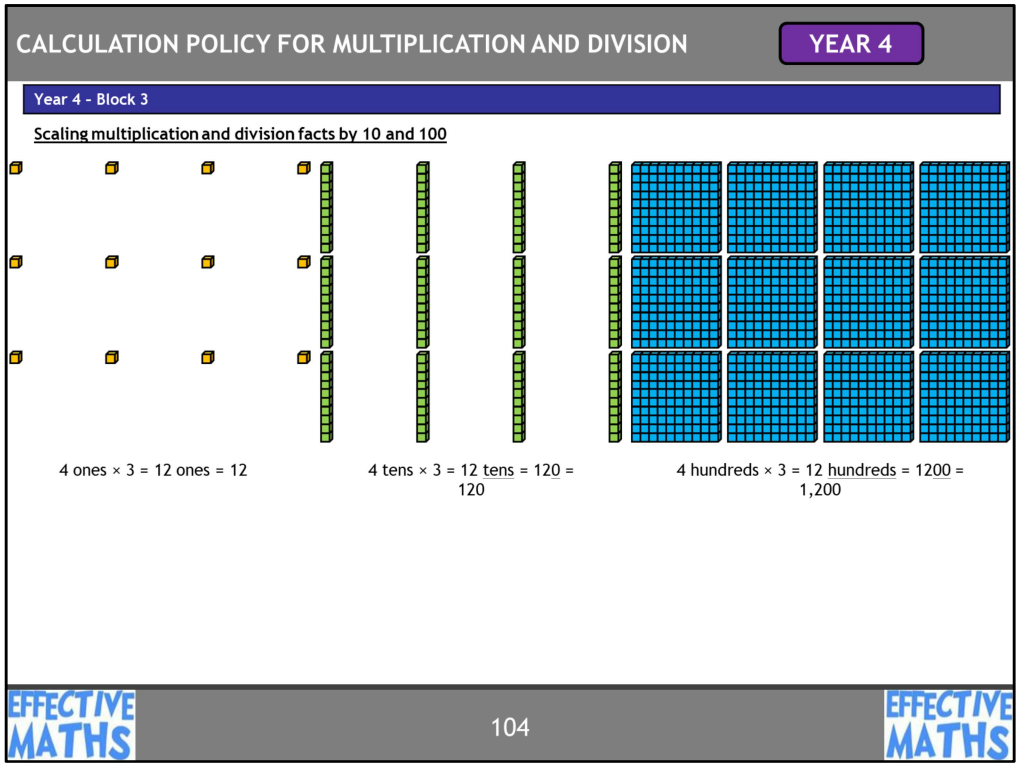


BLOCK 3
CALCULATION UNIT

Multiplying 3 numbers

In Year 2 children learnt to add three 1-digit numbers and that the order they added them was not important because addition is commutative. By this stage in Year 4 they know that multiplication is also commutative and they learn to multiply three numbers. Arrays support conceptual understanding.

For example, the first array shows 3 × 2 where the '3' is the number of rows and the '2' is the number of rows. We have 4 lots of 3 × 2 resulting in 3 × 2 × 4.



Scaling multiplication and division facts by 10 and 100

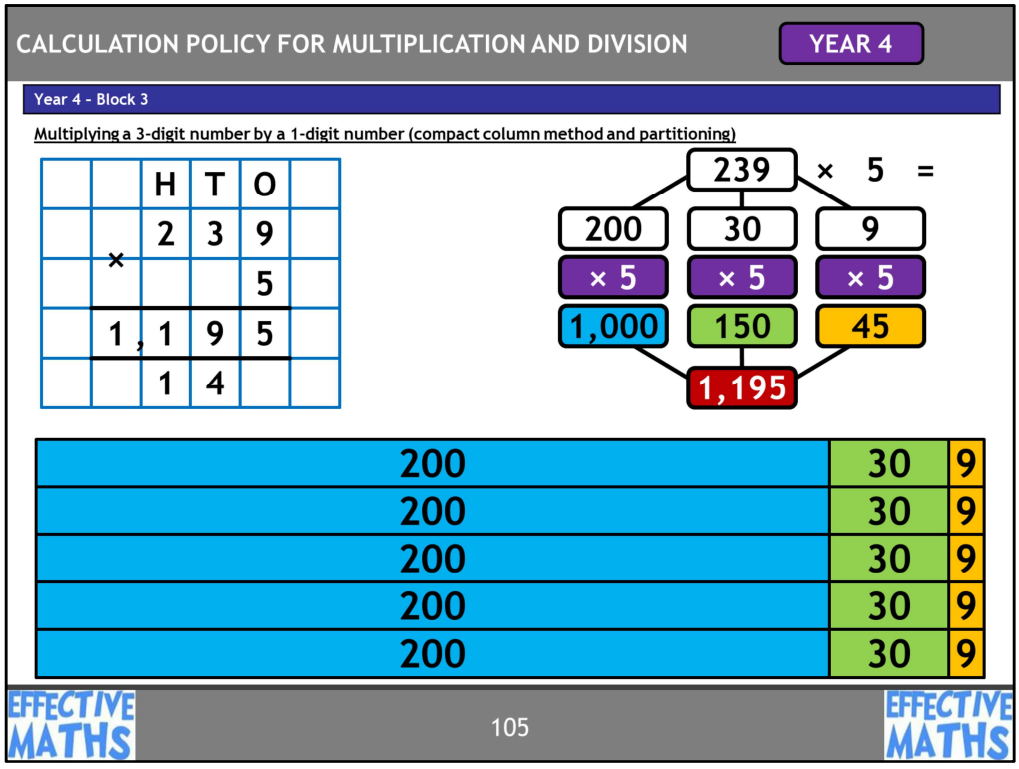
Children have had considerable experience with scaling number facts by ten and some previous experience of scaling facts by one hundred. For example, known addition and subtraction facts were scaled by one hundred in + and – unit 1. Some work on scaling by one hundred for multiplicative facts occurred in earlier × and ÷ units. By the end of Year 4 children should have increasingly good recall of multiplication facts and the associated division facts. They now combine these facts with unitising in hundreds. They learn that in scenarios like 400 × 3 they can use an anchor fact, 4 × 3 = 12.

Because one factor, 4, will be multiplied by 100, then the resulting product must also be multiplied by 100.

4 × 3 = 12 so 400 × 3 = 1,200

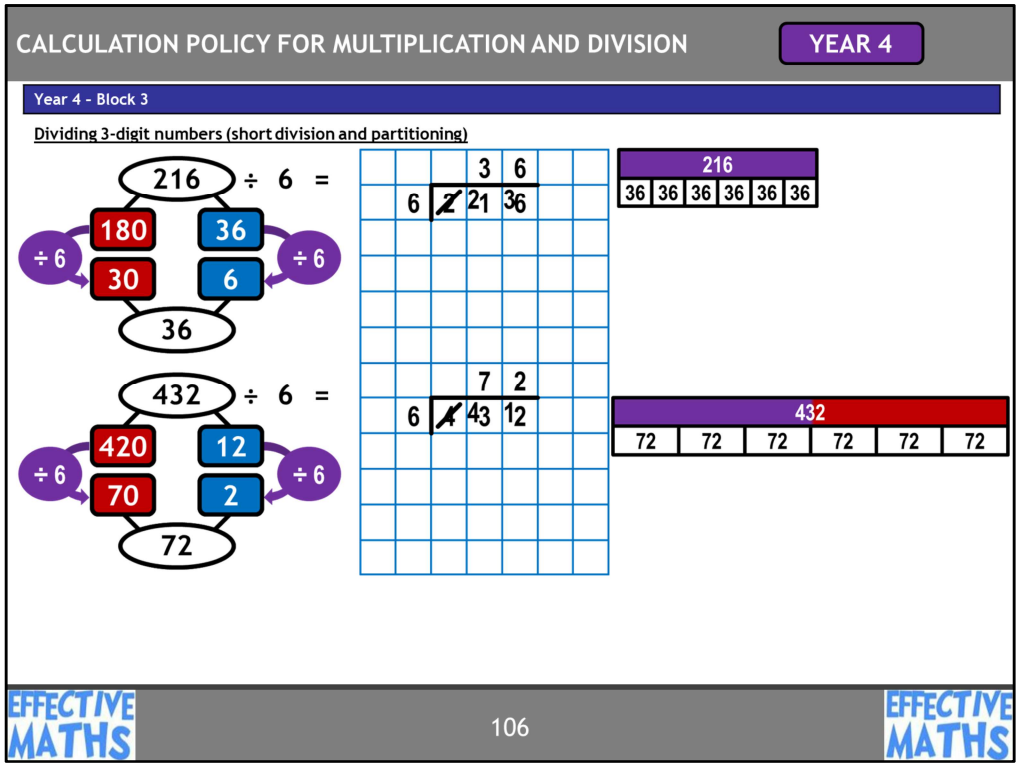
Accurate use of language is key to ensuring understanding. For example:

4 hundreds × 3 = 12 hundreds = 1200 = 1,200



Multiplying a 3-digit number by a 1-digit number (compact column method and partitioning)

Children consolidate understanding of the compact column method and revisit partitioning to secure multiplication of numbers with up to 3 digits. They do this within a problem solving approach and identify relationships between calculations.



Dividing 3-digit numbers (short division and partitioning)
Children consolidate understanding of the short division and revisit partitioning to secure division of numbers with up to 3 digits. They do this within a problem solving approach and identify relationships between calculations.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 5

Year 5			
	Block 1	**Block 2**	**Block 3**
Calculation content	MULTIPLICATION AND DIVISION (UNIT 1) • 9 × table (r) • Understanding division and recalling division facts • Remainders (r) *(The rest of Block 1 focuses on problem solving, factors, multiples, prime numbers and square numbers.)* FRACTIONS (UNIT 1) • Finding non-unit fractions of quantities MULTIPLICATION AND DIVISION (UNIT 2) • Multiplying and dividing by 10, 100 and 1,000 • Multiplying 4-digit numbers	MONEY AND DECIMALS (UNIT 1) n/a MULTIPLICATION AND DIVISION (UNIT 3) • Scaling multiplication and division facts by one-tenth and one-hundredth • Multiplying 2-digit numbers by 2-digit numbers (open arrays, grid method and expanded column method) • Dividing numbers with up to 4 digits by 8 • Dividing numbers with up to 4 digits FRACTIONS (UNIT 2) • Multiplying proper fractions by whole numbers • Multiplying mixed numbers by whole numbers	CALCULATION UNIT • Multiplying 3- and 4-digit numbers by 2-digit numbers • Division (r) ○ Division methods for division of numbers with up to 4 digits; related facts; remainders MONEY AND DECIMALS (UNIT 2) n/a

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 5

Year 5			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>9 × table (r)</u> Multiplication and division (Unit 1) focuses mainly on problem solving, factors, multiples, prime numbers and square numbers. Two lessons focus primarily on calculation. Revision of the 9 × table consolidates understanding from earlier year groups. This includes the distributive property of multiplication, through partitioning arrays: 7 × 9 = 5 × 9 + 2 × 9. The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression. Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg: 7 × 9 = 63 9 × 7 = 63	<u>Scaling multiplication and division facts by one-tenth and one-hundredth</u> Children have had lots of experience of combining known additive and multiplicative facts with unitising in tens and hundreds. Here they learn to combine known multiplicative facts with unitising in tenths and hundredths. Accurate use of language is key. *0.04 × 3 = 4-hundredths × 3 = 12-hundredths.* *12-hundredths is made up of 10-hundredths and 2-hundredths.* *10-hundredths (10/100) is equal to one-tenth.* *So we have one-tenth and 2-hundredths.* *We have 0.12.*	<u>Multiplying 3- and 4-digit numbers by 2-digit numbers</u> The final calculation unit develops understanding of long multiplication to include the compact method for numbers with up to 4-digits. Calculations are represented using arrays to ensure conceptual understanding of the multiplication process and attribute meaning to the long multiplication procedure. The array is used on its own and then alongside the formal algorithm for long multiplication. The process for each is the same: multiply the ones; multiply the tens; multiply the hundreds. Accurate use of language is key. Children are very familiar with multiplying by ones in the column layout, eg: 2 ones × 3 = 6 ones; 3 tens × 3 = 9 tens; 1 hundred × 3 = 3 hundreds. *Continued on next page.*

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 5

Year 5			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Understanding division and recalling division facts</u> Initial learning about division revisits the two division structures, sharing and grouping, encountered in earlier years. The multiplication grid is used to obtain division facts. Children interpret the same array to obtain different division facts, eg: 56 squares put into groups of 7 results in 8 groups. 56 squares put into groups of 8 results in 7 groups. Children continue to use partitioning to obtain division facts that cannot be derived automatically from multiplication facts. This is done by partitioning the dividend into parts that are multiples of the divisor, eg: 117 ÷ 9 = 90 ÷ 9 + 27 ÷ 9. Initially arrays are used to support understanding of the partitioning. Later numeric representations are used. Another method for division, using factors, is also encountered.	<u>Multiplying a 2-digit number by a 2-digit number (open arrays, grid method and expanded column method)</u> Learning to multiply a 2-digit number by a 2-digit number is introduced with an array. (The initial array enables children to see all the parts - teaching moves on to using open arrays.) The open array supports conceptual understanding of the process of multiplying a 2-digit number by a 2-digit number. The grid method reflects the open array very strongly, with the key difference being that the size of the parts in the grid method are not to scale. Children are very familiar with the expanded column method for multiplying a number by a 1-digit number and the expanded method is now used to multiply a 2-digit number by a 2-digit number. Teaching models accurate use of language to ensure conceptual understanding	They also have considerable experience of multiplying by multiples of ten, but not recording in the column layout. Again, accurate use of language is key: 2 ones × 20 = 40 ones = 4 tens; 3 tens × 20 = 60 tens = 6 hundreds = 600; 1 hundred × 20 = 20 hundreds = 2,000 The grid method continues to be used. Whilst it is not the prime strategy, children are encouraged to make connections between the grid representation and the algorithm for long multiplication. Initial examples have no exchanging in the multiplication part of the algorithm. Exchanging is introduced later on.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 5

Year 5			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Remainders Remainders were introduced in Year 4 (Block 1 (Unit 2). Revisit key teaching points: • if the dividend is a multiple of the divisor there is no remainder; • if the dividend is not a multiple of the divisor there is a remainder; • the remainder is always less than the divisor. Finding non-unit fractions of quantities Children were introduced to finding non-unit fractions of quantities in Year 4. This was done using division facts linked to multiplication tables from Year 2 and Year 3. In Year 5, children find non-unit fractions of quantities using division facts linked to the 6, 9 and 7 multiplication tables. They also find non-unit fractions of quantities for calculations that go beyond known multiplication table facts.	Dividing numbers with up to 4 digits Children have experience of all three methods used. The difference is that they are now applied to numbers with up to 4-digits. Partitioning supports conceptual understanding about division. The dividend is partitioned into parts that are divisible by the divisor. There is no set number of parts to partition the dividend into. Children need to think about partitioning in non-standard ways. Understanding of the short division method is enhanced by accurate use of language.	Methods for division (r) Learning about division consolidates understanding of division from earlier in the year. Teaching revisits division of numbers with 4 digits, related facts (same multiplicative change to the dividend and the divisor meaning the resulting quotient stays the same) and remainders.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

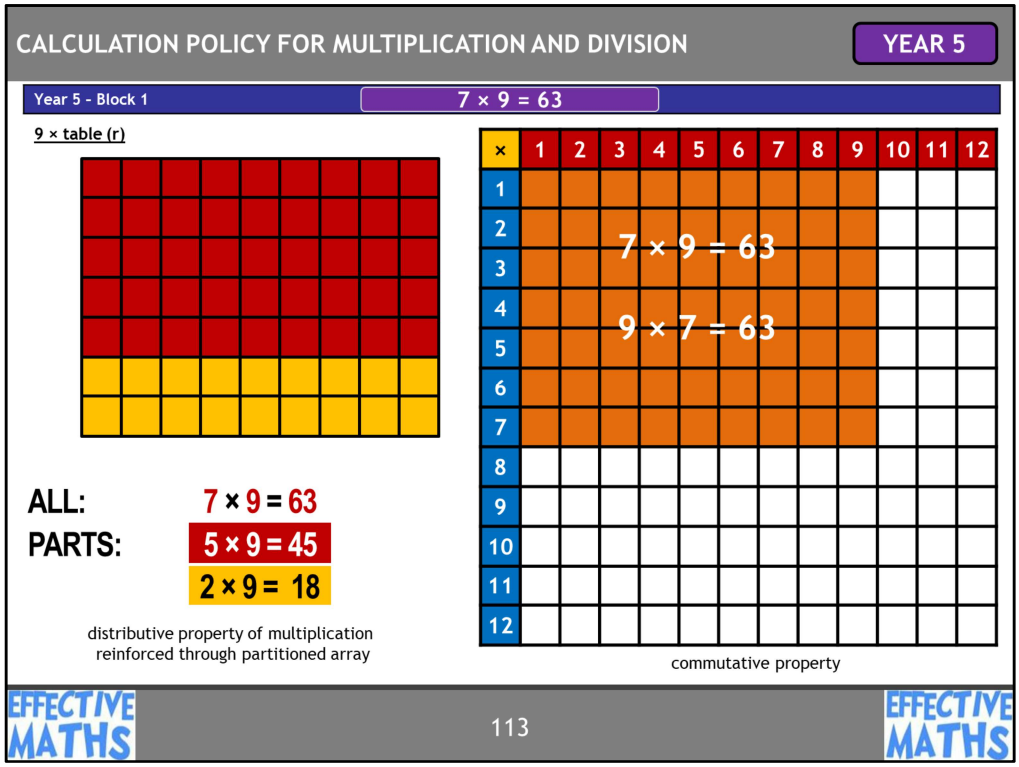
YEAR 5

Year 5			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Multiplying and dividing by 10, 100 and 1,000</u> Multiplying and dividing by 10 and 100 was introduced in Money and Decimals (Unit 1) in Year 4. In Year 5 learning is extended to include multiplying and dividing by 1,000. Teaching develops understanding of relationships between powers of ten, and models describing them using scaling language, eg: … times the size. Contexts involve both whole numbers and decimal numbers.	<u>Multiplying proper fractions by whole numbers</u> Initial work on multiplying proper fractions focuses on using repeated addition and the associated multiplication expression. The emphasis is on the conceptual understanding associated with multiplying fractions and to begin with children are not encouraged to find the answer/product. Work begins with unit fractions and progresses to non-unit fractions. The pictorial representations are then removed and learning continues in the same manner. Next finding the product (answer) is introduced. Children learn that the numerator of the fraction is multiplied by the whole number and the denominator remains the same. Learning moves on to consider examples where the product is more than one whole.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 5

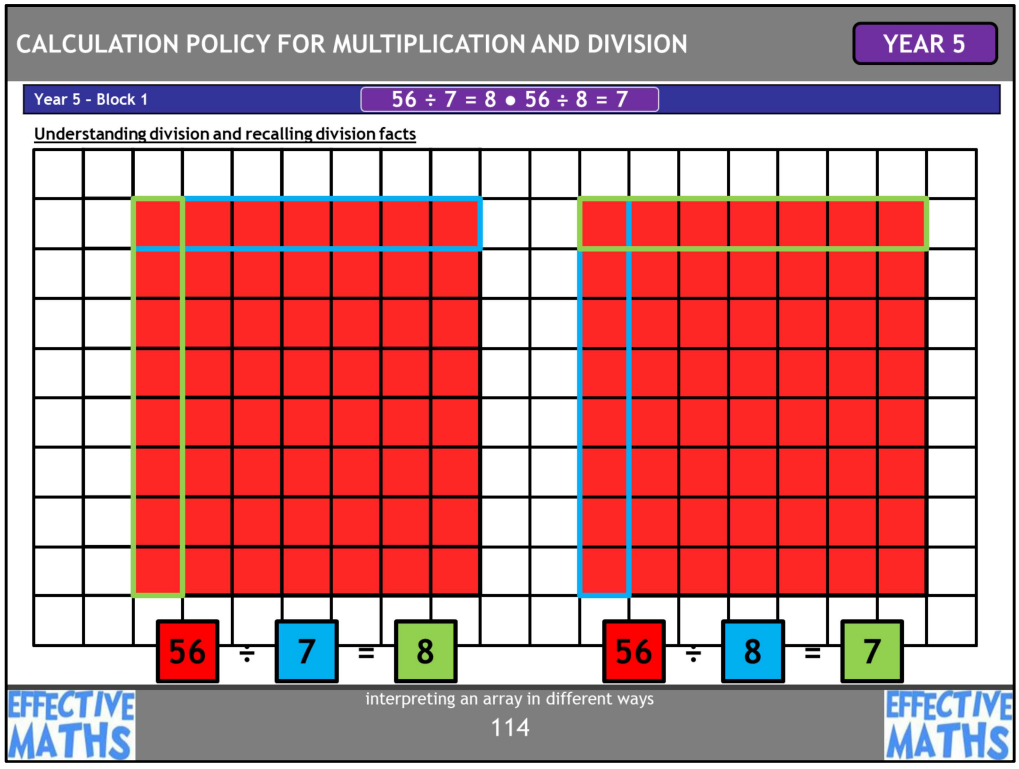
Year 5			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Multiplying 4-digit numbers</u> Multiplying a 3-digit number by a 1-digit number was learnt during Year 4. Learning to multiply 4-digit numbers begins with the expanded column method and then moves to the compact method. The expanded method supports conceptual understanding of the compact column method. Accurate use of language is key to ensuring conceptual understanding. For example: *9 ones × 3 = 27 ones. 27 ones = 2 tens and 7 ones.* *6 tens × 3 = 18 tens. Plus the 2 tens that were exchanged which makes 20 tens. 20 tens = 2 hundreds and 0 tens.* etc	<u>Multiplying mixed numbers by whole numbers</u> Learning to multiply mixed numbers by whole numbers begins with examples where the fractional parts multiply to less than one whole. For example: 3 × 2 3/10 The core strategy modelled is to partition the mixed number into a whole number and a fraction. Multiply the wholes. Multiply the fractional parts. Combine. Next children encounter examples where the fractional parts multiply to more than one whole. For example: 3 × 2 4/10 The same partitioning procedure is used. The initial combining results in the non-conventional format of a mixed number with an improper fractional part. (In this instance, 12 28/20.) Whilst this is structurally correct, explain that convention means we write the mixed number so the numerator is less than the denominator.	



BLOCK 1
× AND ÷ UNIT 1

9 × table (r)
Multiplication and division (Unit 1) focuses mainly on problem solving, factors, multiples, prime numbers and square numbers.
Two lessons focus primarily on calculation.
Revision of the 9 × table consolidates understanding from earlier year groups. This includes the distributive property of multiplication, through partitioning arrays:
7 × 9 = 5 × 9 + 2 × 9.
The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression.

Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg:
7 × 9 = 63
9 × 7 = 63

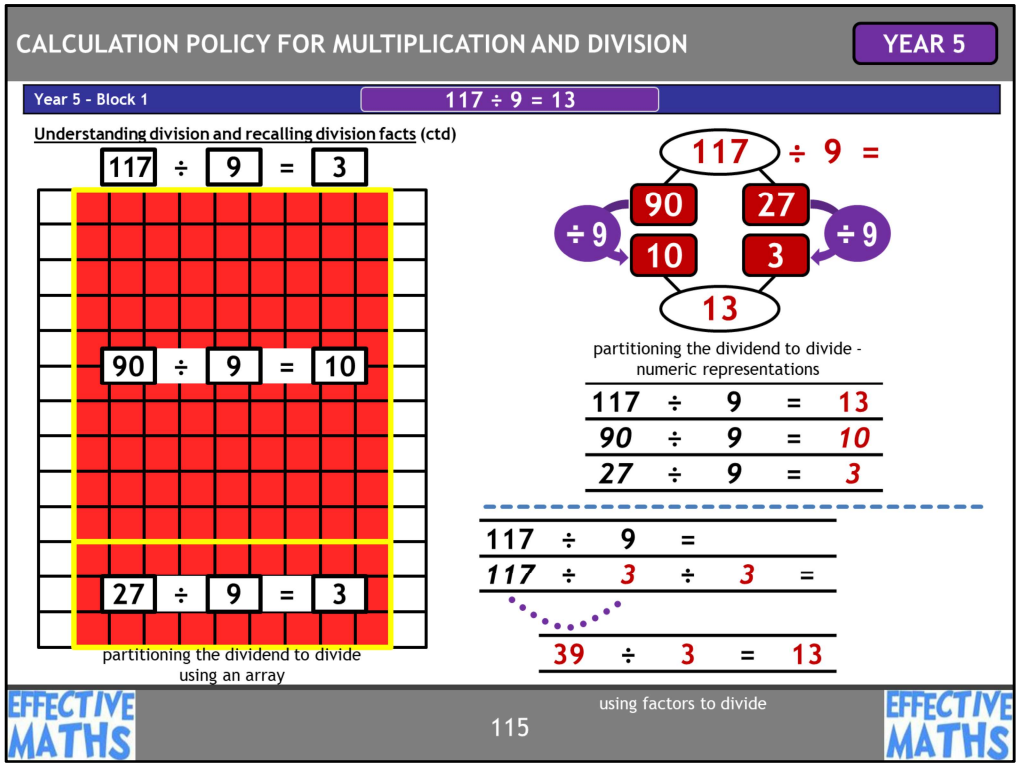


Understanding division and recalling division facts

Initial learning about division revisits the two division structures, sharing and grouping, encountered in earlier years. The multiplication grid is used to obtain division facts.

Children interpret the same array to obtain different division facts, eg:

- 56 squares put into groups of 7 results in 8 groups. (If the blue rectangle is a group).
- 56 squares put into groups of 8 results in 7 groups.

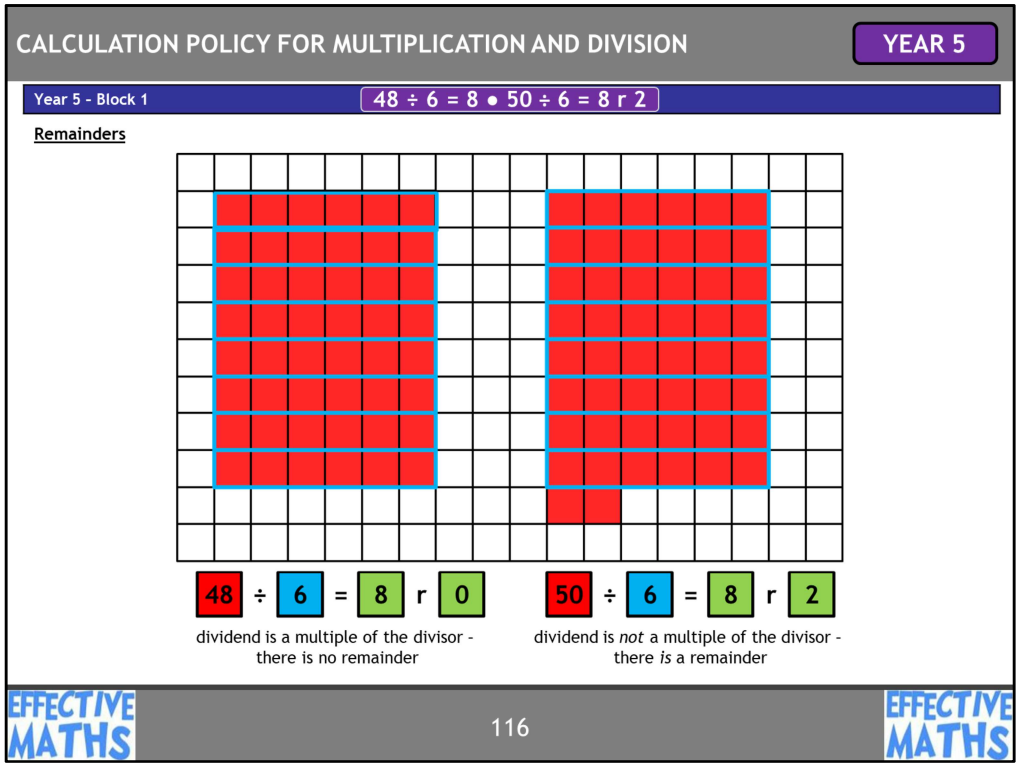


Understanding division and recalling division facts (ctd)

Children continue to use partitioning to obtain division facts that cannot be derived automatically from multiplication facts. This is done by partitioning the dividend into parts that are multiples of the divisor, eg:
117 ÷ 9 = **90** ÷ 9 + **27** ÷ 9.

Initially arrays are used to support understanding of the partitioning. Later numeric representations are used.

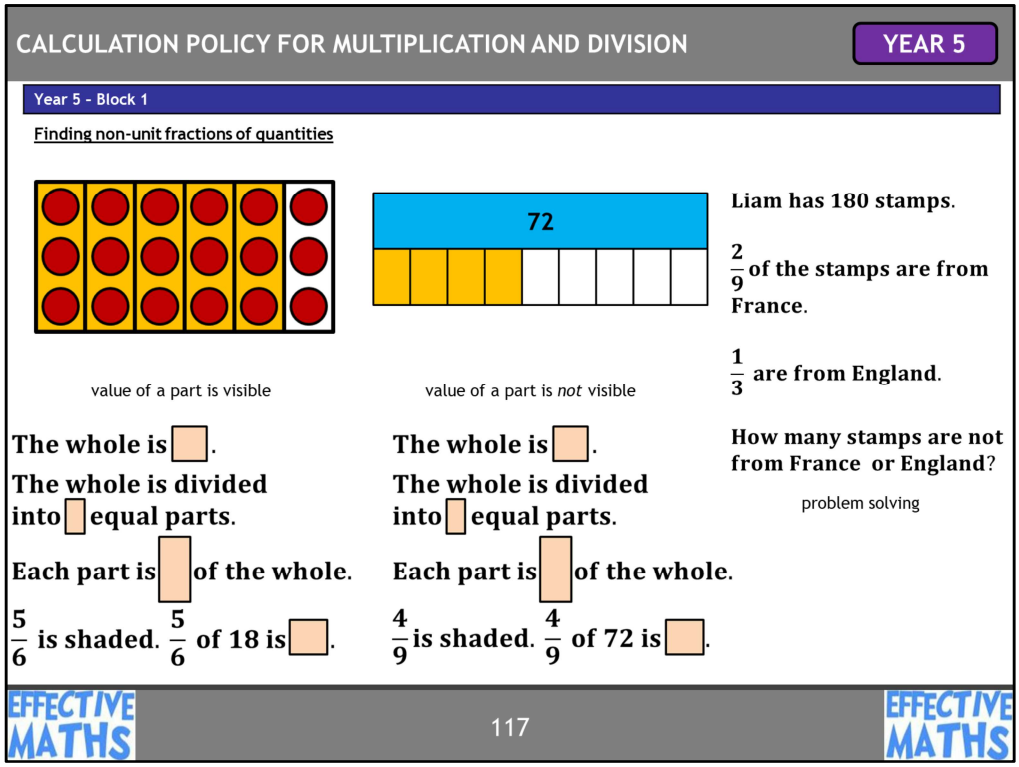
Another method for division, using factors, is also encountered.



Remainders

Remainders were introduced in Year 4 (Block 1 (Unit 2).
Revisit key teaching points:

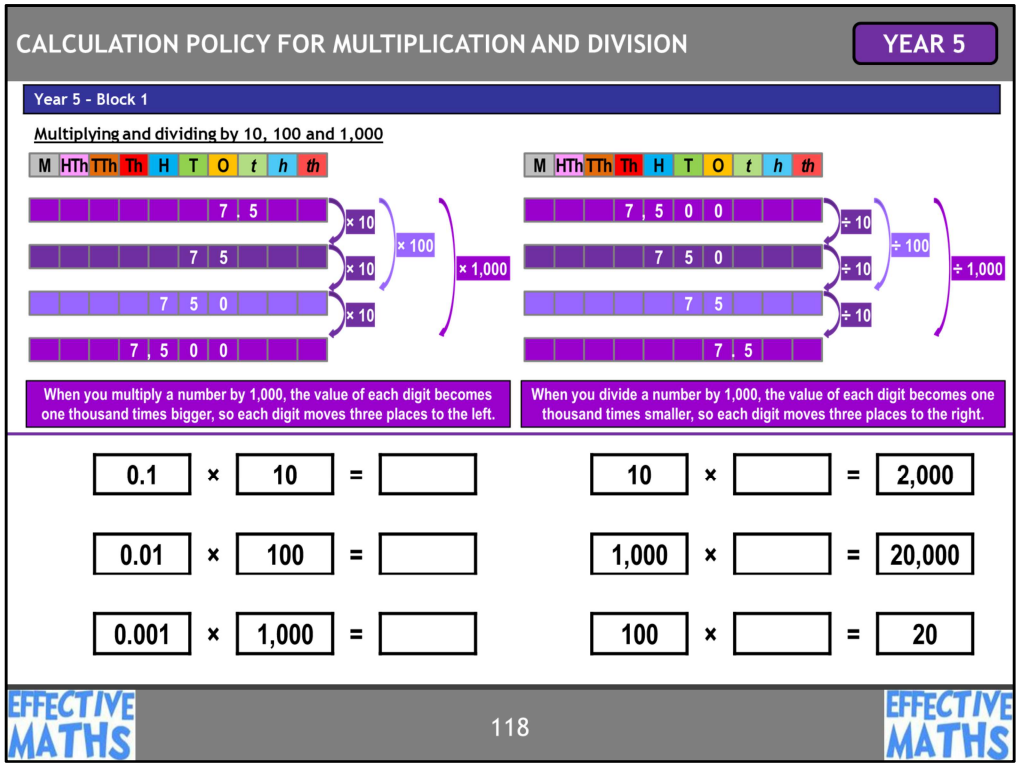
- if the dividend is a multiple of the divisor there is no remainder;
- if the dividend is not a multiple of the divisor there is a remainder;
- the remainder is always less than the divisor.



BLOCK 1
FRACTIONS UNIT 1

Finding non-unit fractions of quantities

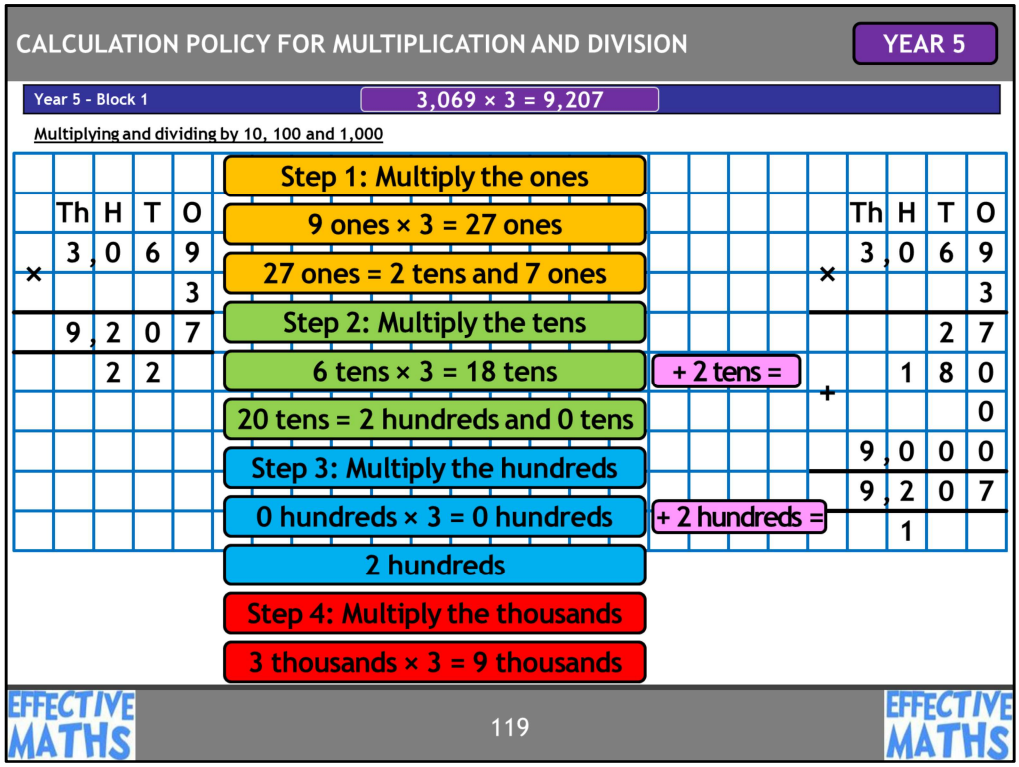
Children were introduced to finding non-unit fractions of quantities in Year 4. This was done using division facts linked to multiplication tables from Year 2 and Year 3. In Year 5, children find non-unit fractions of quantities using division facts linked to the 6, 9 and 7 multiplication tables. They also find non-unit fractions of quantities for calculations that go beyond known multiplication table facts.



BLOCK 1
× AND ÷ UNIT 2

Multiplying and dividing by 10, 100 and 1,000

Multiplying and dividing by 10 and 100 was introduced in Money and Decimals (Unit 1) in Year 4. In Year 5 learning is extended to include multiplying and dividing by 1,000. Teaching develops understanding of relationships between powers of ten, and models describing them using scaling language, eg: … *times the size*. Contexts involve both whole numbers and decimal numbers.

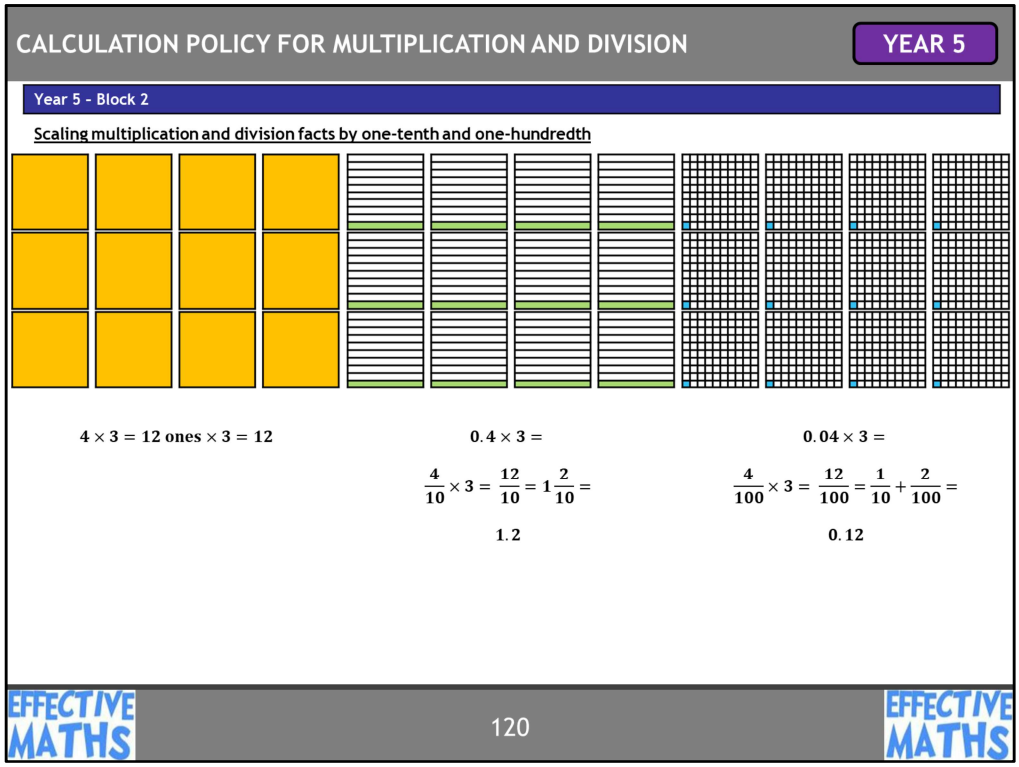


Multiplying 4-digit numbers

Multiplying a 3-digit number by a 1-digit number was learnt during Year 4.
Learning to multiply 4-digit numbers begins with the expanded column method and then moves to the compact method.
The expanded method supports conceptual understanding of the compact column method.
Accurate use of language is key to ensuring conceptual understanding. For example:

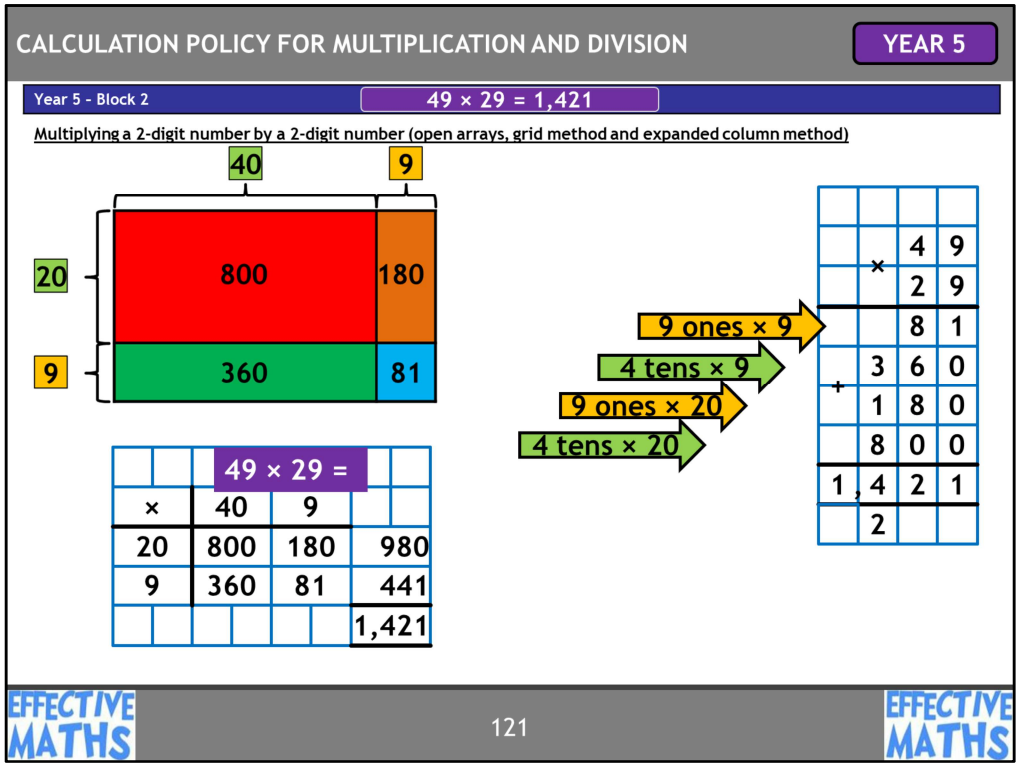
9 ones × 3 = 27 ones. 27 ones = 2 tens and 7 ones.

6 tens × 3 = 18 tens. Plus the 2 tens that were exchanged which makes 20 tens. 20 tens = 2 hundreds and 0 tens.
etc



BLOCK 2
× AND ÷ UNIT 3

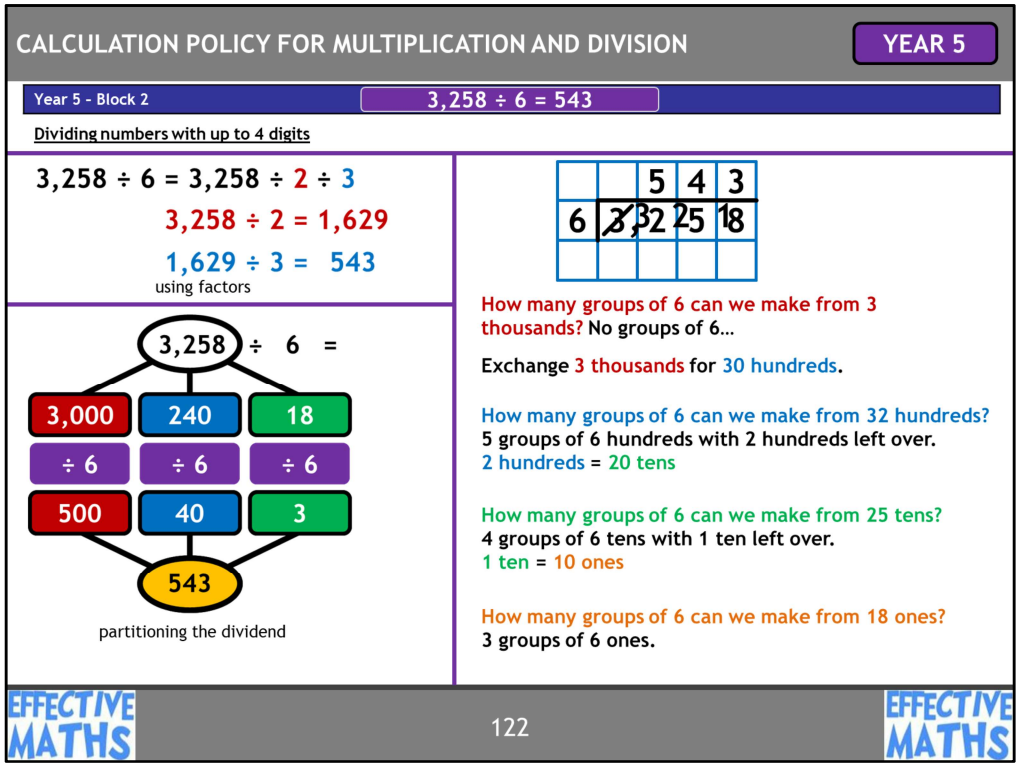
Scaling multiplication and division facts by one-tenth and one-hundredth
Children have had lots of experience of combining known additive and multiplicative facts with unitising in tens and hundreds. Here they learn to combine known multiplicative facts with unitising in tenths and hundredths. Accurate use of language is key.
0.04 × 3 = 4-hundredths × 3 = 12-hundredths.
12-hundredths is made up of 10-hundredths and 2-hundredths.
10-hundredths (10/100) is equal to one-tenth.
So we have one-tenth and 2-hundredths.
We have 0.12.



Multiplying a 2-digit number by a 2-digit number (open arrays, grid method and expanded column method)

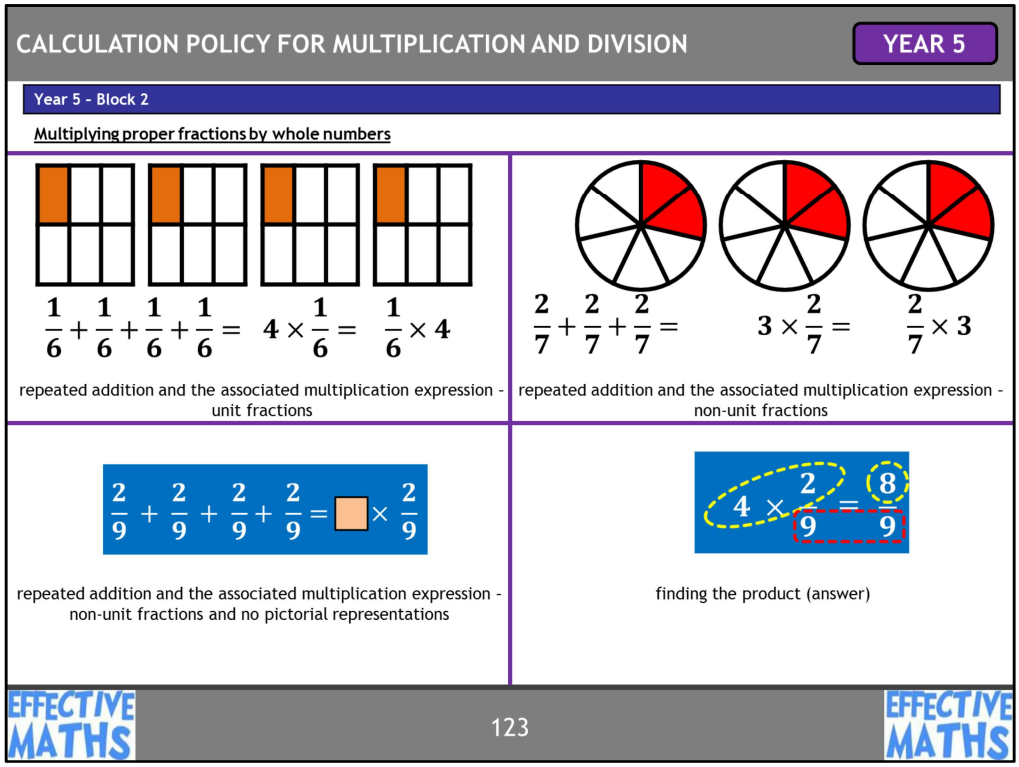
Learning to multiply a 2-digit number by a 2-digit number is introduced with an array. (The initial array enables children to see all the parts – teaching moves on to using open arrays as shown here.) The open array supports conceptual understanding of the process of multiplying a 2-digit number by a 2-digit number. The grid method reflects the open array very strongly, with the key difference being that the size of the parts in the grid method are not to scale.

Children are very familiar with the expanded column method for multiplying a number by a 1-digit number and the expanded method is now used to multiply a 2-digit number by a 2-digit number. Teaching models accurate use of language to ensure conceptual understanding.



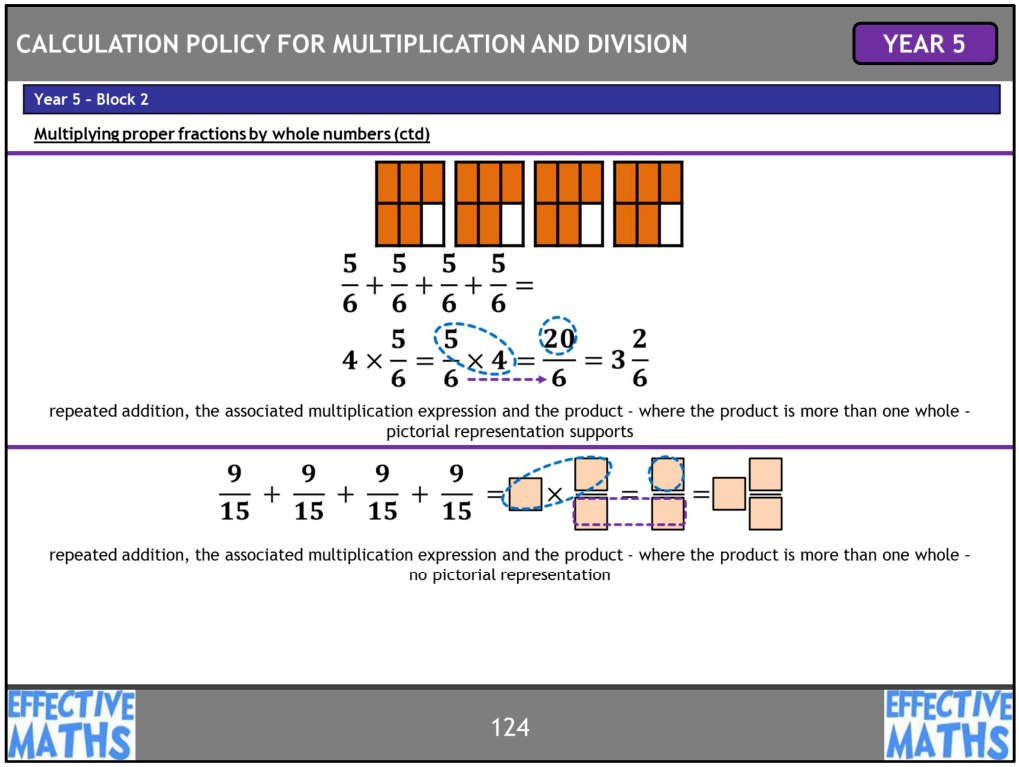
Dividing numbers with up to 4 digits

Children have experience of all three methods used. The difference is that they are now applied to numbers with up to 4-digits. Partitioning supports conceptual understanding about division. The dividend is partitioned into parts that are divisible by the divisor. There is no set number of parts to partition the dividend into. Children need to think about partitioning in non-standard ways. Understanding of the short division method is enhanced by accurate use of language.



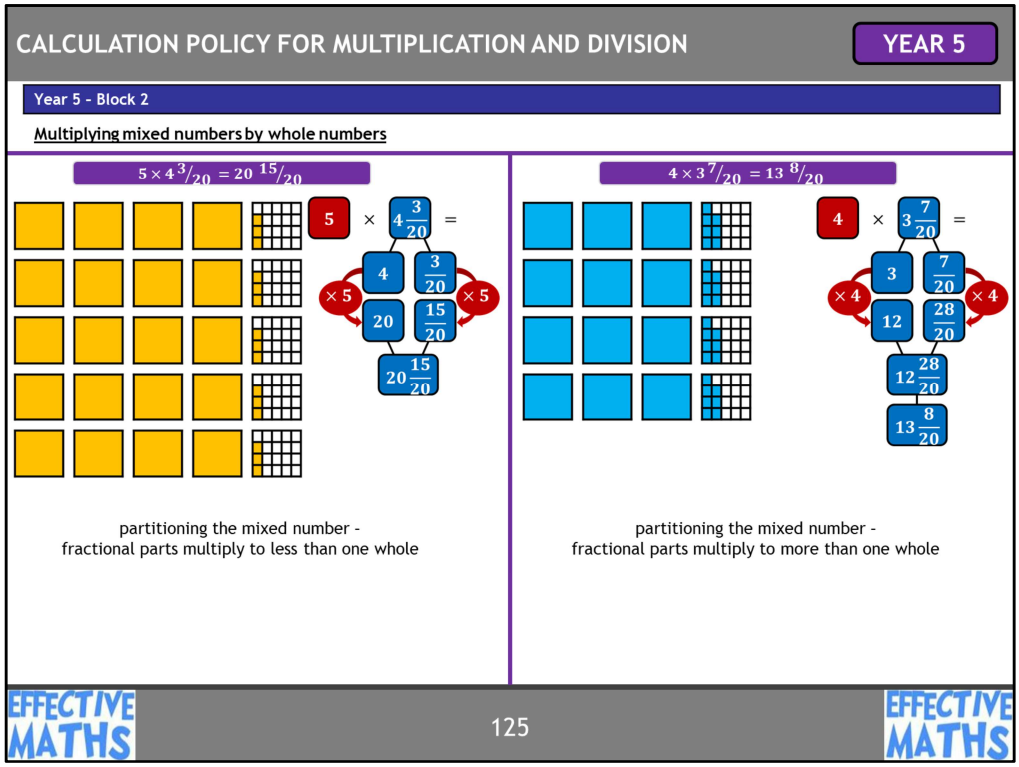
BLOCK 2
FRACTIONS UNIT 2

<u>Multiplying proper fractions by whole numbers</u>
Initial work on multiplying proper fractions focuses on using repeated addition and the associated multiplication expression. The emphasis is on the conceptual understanding associated with multiplying fractions and to begin with children are not encouraged to find the answer/product. Work begins with unit fractions and progresses to non-unit fractions.
The pictorial representations are then removed and learning continues in the same manner. Next finding the product (answer) is introduced. Children learn that the numerator of the fraction is multiplied by the whole number and the denominator remains the same.



Multiplying proper fractions by whole numbers (ctd)

Learning moves on to consider examples where the product is more than one whole.



Multiplying mixed numbers by whole numbers

Learning to multiply mixed numbers by whole numbers begins with examples where the fractional parts multiply to less than one whole. For example:

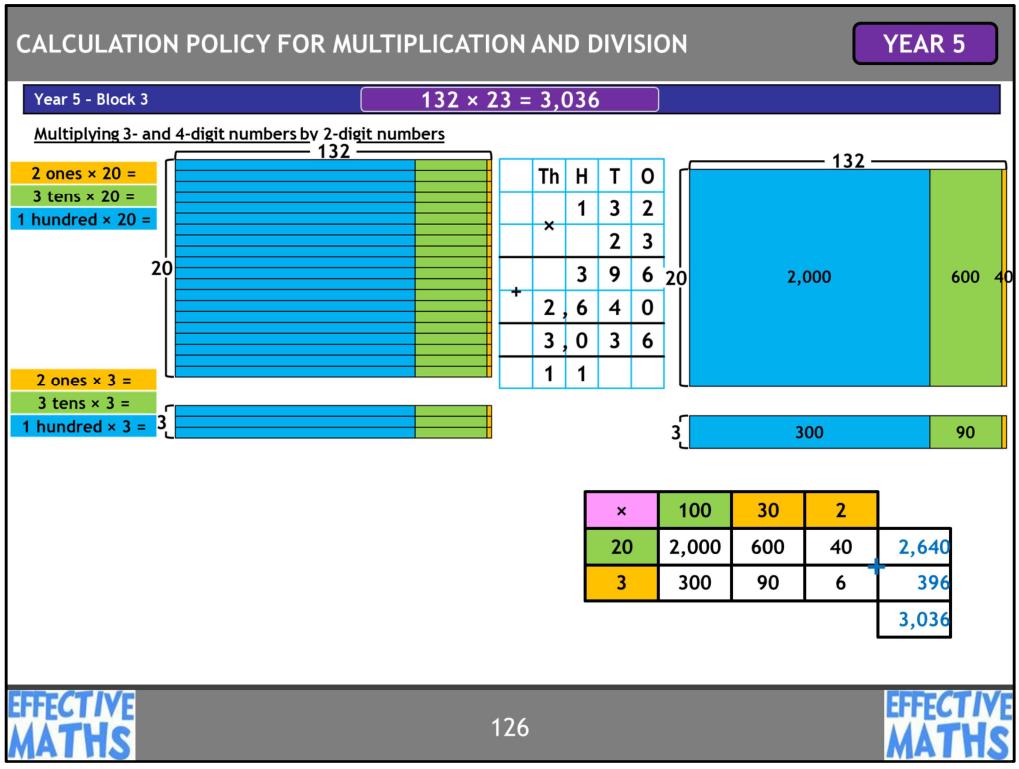
3 × 2 3/10

The core strategy modelled is to partition the mixed number into a whole number and a fraction. Multiply the wholes. Multiply the fractional parts. Combine.

Next children encounter examples where the fractional parts multiply to more than one whole. For example:

3 × 2 4/10

The same partitioning procedure is used. The initial combining results in the non-conventional format of a mixed number with an improper fractional part. (In this instance, 12 28/20.) Whilst this is structurally correct, explain that convention means we write the mixed number so the numerator is less than the denominator.



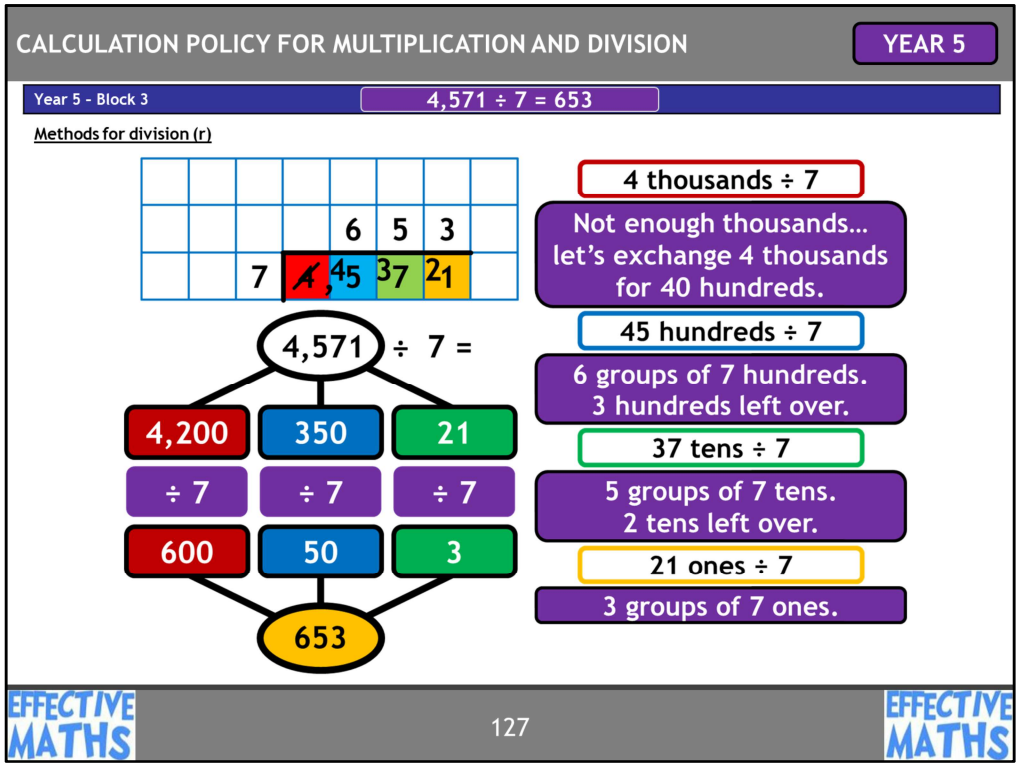
BLOCK 3
CALCULATION UNIT

Multiplying 3- and 4-digit numbers by 2-digit numbers

The final calculation unit develops understanding of long multiplication to include the compact method for numbers with up to 4-digits. Calculations are represented using arrays to ensure conceptual understanding of the multiplication process and attribute meaning to the long multiplication procedure. The array on the left is used on its own and then alongside the formal algorithm for long multiplication. The process for each is the same:
multiply the ones; multiply the tens; multiply the hundreds.
Accurate use of language is key. Children are very familiar with multiplying by ones in the column layout, eg:
2 ones × 3 = 6 ones;
3 tens × 3 = 9 tens;
1 hundred × 3 = 3 hundreds.

They also have considerable experience of multiplying by multiples of ten, but not recording in the column layout. Again, accurate use of language is key:
2 ones × 20 = 40 ones = 4 tens;
3 tens × 20 = 60 tens = 6 hundreds = 600;
1 hundred × 20 = 20 hundreds = 2000

The grid method continues to be used. Whilst it is not the prime strategy, children are encouraged to make connections between the grid representation and the algorithm for long multiplication.
Initial examples have no exchanging in the multiplication part of the algorithm. Exchanging is introduced later on.



Methods for division (r)

Learning about division consolidates understanding of division from earlier in the year. Teaching revisits division of numbers with 4 digits, related facts (same multiplicative change to the dividend and the divisor meaning the resulting quotient stays the same) and remainders.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Calculation content	MULTIPLICATION AND DIVISION (UNIT 1) • 7 × table (r) • Efficient strategies for multiplication • Efficient strategies for division • Multiplying 3- and 4-digit numbers by 2-digit numbers (r) FRACTIONS (UNIT 1) • Finding fractions of quantities MULTIPLICATION AND DIVISION (UNIT 2) • Dividing by a 2-digit number ○ *Factors* ○ *Partitioning* ○ *Short division* ○ *Long division*	MONEY AND DECIMALS (UNIT 2) • × and ÷ numbers by 10, 100 and 1,000 (r) MULTIPLICATION AND DIVISION (UNIT 3) n/a All work is problem solving. FRACTIONS (UNIT 2) • Multiplying fractions ○ *Multiplying proper fractions by whole numbers* ○ *Multiplying mixed numbers by whole numbers* ○ *Multiplying pairs of proper fractions* • Dividing fractions ○ *Dividend is a fraction - divisor is whole number; numerator is a multiple of the whole number* ○ *Dividend is a whole number - divisor is a fraction* ○ *Dividing a fraction by a whole number where numerator is not multiple of whole number*	CALCULATION UNIT • Derive related calculations MONEY AND DECIMALS (UNIT 2) n/a

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	7 × table (r) Revision of the 7 × table consolidates understanding from earlier year groups. This includes the distributive property of multiplication, through partitioning arrays: 6 × 7 = 5 × 7 + 1 × 7. The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression. Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg: 6 × 7 = 42 7 × 6 = 42 Understanding about the multiplication grid is deepened through challenging tasks involving finding missing products on parts of multiplication grids.	× and ÷ numbers by 10, 100 and 1,000 (r) Children revisit multiplying and dividing numbers with up to three decimal places by 10, 100 and 1,000. (This was first encountered in Year 5, × and ÷ unit 2.) The place value chart is used to highlight what happens to the digits when we multiply or divide by 10, 100 and 1,000. Activities require children to think carefully about multiplicative relationships when multiplying and dividing by 10, 100 and 1,000.	Derive related calculations Children have used the compensation property of multiplication previously, for example, when recognising connections between multiplication table facts: 5 × 8 = 10 × 4. They have also used it as method to simplify calculations: 22 × 16 = 44 × 8. This learning is consolidated and children secure learning that if one factor is multiplied by a number, then the other factor must be divided by the same number for the product to stay the same. They use this knowledge to complete equations such as 0.4 × 240 = 4 × __ and, more generally, to help them simplify calculations. Children have learnt to scale known number facts by 10, 100, one-tenth and one-hundredth. They know that if one factor is multiplied by a number, and the other factor kept the same, then the product must be multiplied by the same number. This knowledge is applied to solve missing number problems and also as a method to simplify calculations.

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Efficient strategies for multiplication</u> Some calculations, often those with larger numbers, may be best solved with column methods. Understanding about how multiplication works is enhanced through familiarity with a range of methods, which also support mental calculation with smaller numbers. Efficient strategies for multiplication include: • column methods; • partitioning methods; • factors; • relationships; • compensation. Certain calculations will lend themselves more readily to one or more of the above, so encouraging proficiency in more than one method is important. It also deepens understanding.	<u>Multiplying proper fractions and mixed numbers by whole numbers (r)</u> Teaching about the multiplication of fractions begins by revisiting learning from Year 5 about multiplying fractions by whole numbers. ***Multiplying proper fractions by whole numbers*** The focus here is on understanding that we multiply the numerator by the whole number; we do not multiply the denominators. Repeated addition is used to help reinforce the concept: eight-tenths plus eight-tenths plus eight-tenths = twenty-four tenths = 2 and four-tenths	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Efficient strategies for division As with multiplication, some calculations, often those with larger numbers, may be best solved with column methods. Understanding about how division works is enhanced through familiarity with a range of methods, which also support mental calculation with smaller numbers. Efficient strategies for division include: • column methods; • partitioning methods; • factors; • relationships.	***Multiplying mixed fractions by whole numbers*** Partition 3 7/20 into whole parts and fractional parts. Multiply the wholes. Multiply the fractional parts. Combine. The initial combining results in the non-conventional format of a mixed number with an improper fractional part. In this instance, 12 28/20. Whilst this is structurally correct, explain that convention means we write the mixed number so the numerator is less than the denominator.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Additional understanding about division</u> Children have learnt about multiplicative change to the dividend **and** the divisor meaning the resulting quotient changes by the same scale factor. They also learn that: • if there is a multiplicative change to the dividend and the divisor remains the same, the quotient changes by the same scale factor; • but if there is a multiplicative decrease to the divisor and the dividend remains the same, the quotient increases by the same scale factor; • and if there is a multiplicative increase to the divisor and the dividend remains the same, the quotient decreases by the same scale factor.	<u>Multiplying pairs of proper fractions</u> Learning about multiplying pairs of proper fractions begins with addressing the misconception that multiplication makes things bigger. Teaching highlights that multiplication can make things bigger, result in no change or can make things smaller. 2 × 2 = 4 1 × 1 = 1 ½ × ½ = ¼ Teaching highlights the varied vocabulary used for the multiplication symbol and teaches children that one word that can be used for it is 'of'. ½ of ½ = ¼ Children learn the rules for multiplying pairs of proper fractions. [1] Multiply the numerators of the fractions to get the new numerator. [2] Multiply the denominators of the fractions to get the new denominator. [3] Simplify if needed. Conceptual understanding is developed by explaining how multiplication equations connect to visual representations.	

CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Multiplying 3- and 4-digit numbers by 2-digit numbers (r)</u> Unit 1 ends with work to consolidate understanding of long multiplication. Calculations are represented using arrays to ensure conceptual understanding of the multiplication process and attribute meaning to the long multiplication procedure. The array is used on its own and then alongside the formal algorithm for long multiplication. The process for each is the same: multiply the ones; multiply the tens; multiply the hundreds. Accurate use of language is key. Children are very familiar with multiplying by ones in the column layout, eg: 5 ones × 4 = 20 ones = 2 tens = 20; 3 tens × 4 = 12 tens = 120; 1 hundred × 4 = 4 hundreds.	<u>Dividing a fraction by a whole number</u> Learning to divide a fraction by a whole number begins with examples where the dividend is a fraction, the divisor is whole number and the numerator is a multiple of the whole number. For example: 6/7 ÷ 3. Pictorial representations support conceptual understanding that we are not dividing the denominator. Children need to understand that the denominator tells us about the size of the parts and the numerator tells us how many parts there are.	

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Again, accurate use of language is key: 5 ones × 20 = 100 ones = 1 hundred = 100; 3 tens × 20 = 60 tens = 6 hundreds = 600; 1 hundred × 20 = 20 hundreds = 2000. The grid method continues to be used. Whilst it is not the prime strategy, children are encouraged to make connections between the grid representation and the algorithm for long multiplication.	<u>Dividing a whole number by a unit fraction</u> Now the examples have the dividend as a whole number and the divisor is a fraction. For example: 4 ÷ 1/3. Pictorial representations support conceptual understanding. The key teaching point here is about visualising how many thirds are 'inside' the dividend. Start by getting the children to think about how many thirds are in one. Then build that up to how many thirds are in two, three and four. Highlight the relationship between the whole number and the denominator. Finally, ask if it can be solved another way. • Decimal equivalents. These will not be useful here as we are dividing by one-third. However they would be if the calculation were 4 ÷ ¼, for example. • Scaling. Multiply the fraction by 3 to obtain 1, resulting in: 12 ÷ 1 = 12.	

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Finding fractions of quantities Children have had lots of experience of finding unit fractions of quantities and, from Year 4, finding non-unit fractions of quantities. The procedure for finding fractions of quantities should be secure. In Year 6 the emphasis is largely on solving problems involving non-unit fractions of quantities. Intelligent calculation practices are also promoted. For example, finding five-sixths of £15 is not best done by dividing £15 by 6 and multiplying the result by 5. Finding one-sixth is far easier by finding one-third and then halving this to obtain one-sixth. Now five-sixths can be obtained.	Dividing a fraction by a whole number The final step in learning to divide a fraction by a whole number involves examples where the dividend is a fraction, the divisor is whole number and the numerator is *not* a multiple of the whole number. For example: 6/7 ÷ 4. Teaching helps children to understand that we need to find an equivalent fraction (in this case 12/14) where we can divide the numerator by the denominator. Pictorial representations support conceptual understanding of this process.	

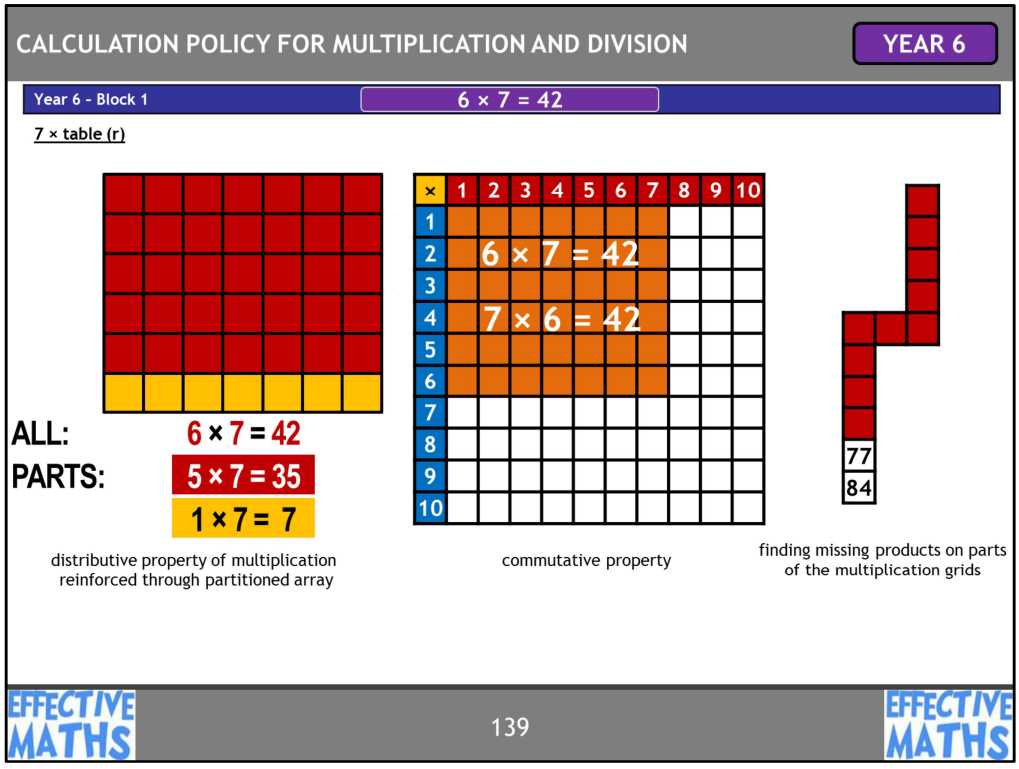
CALCULATION POLICY FOR MULTIPLICATION AND DIVISION

YEAR 6

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by a 2-digit number using factors and using partitioning</u> Partitioning supports conceptual understanding about division. The dividend is partitioned into parts that are divisible by the divisor. There is no set number of parts to partition the dividend into. In the example shown, using chunks of 330 makes things fairly straightforward. Dividing by using factors can be effective for situations where the dividend is not a prime number. In the example shown factors of 33 are used. It does not matter which factor becomes the divisor first of all. Here, it makes sense to divide by 3 first and then 11.		

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by a 2-digit number using short and long division</u> It is important that children realise that both short and long division can be used to divide when dividing with a 2-digit number as the divisor. One of the challenges that arises when dividing by a 2-digit number is that we cannot use division facts from our known multiplication tables. To eliminate this challenge, encourage children to make lists of multiples of the divisor and remind them of simple strategies for making this list. For example, if the divisor is 13 we can add 10 and then add 3. Use of language is key to ensuring conceptual understanding. (continued on next page)		

Year 6			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Dividing by a 2-digit number using short and long division (ctd)</u> **Language for 247 ÷ 13** *2 hundreds ÷ 13 = … Not enough hundreds.* *We need to exchange 2 hundreds for 20 tens.* *24 tens ÷ 13 = 1 group of 13 tens with 11 tens left over.* *Exchange 11 tens for 110 ones. We now have 117 ones ÷ 13.* *Let's use the list of multiples of 13 to help find the answer.* The language used is the same for both methods. The long division layout lets you see the remainders more easily - but this can also be confusing for some children. Where we show the regrouped digits is different in the two methods: in short division we write the regrouped digit/s in the bus stop; in long division we bring the digits down.		

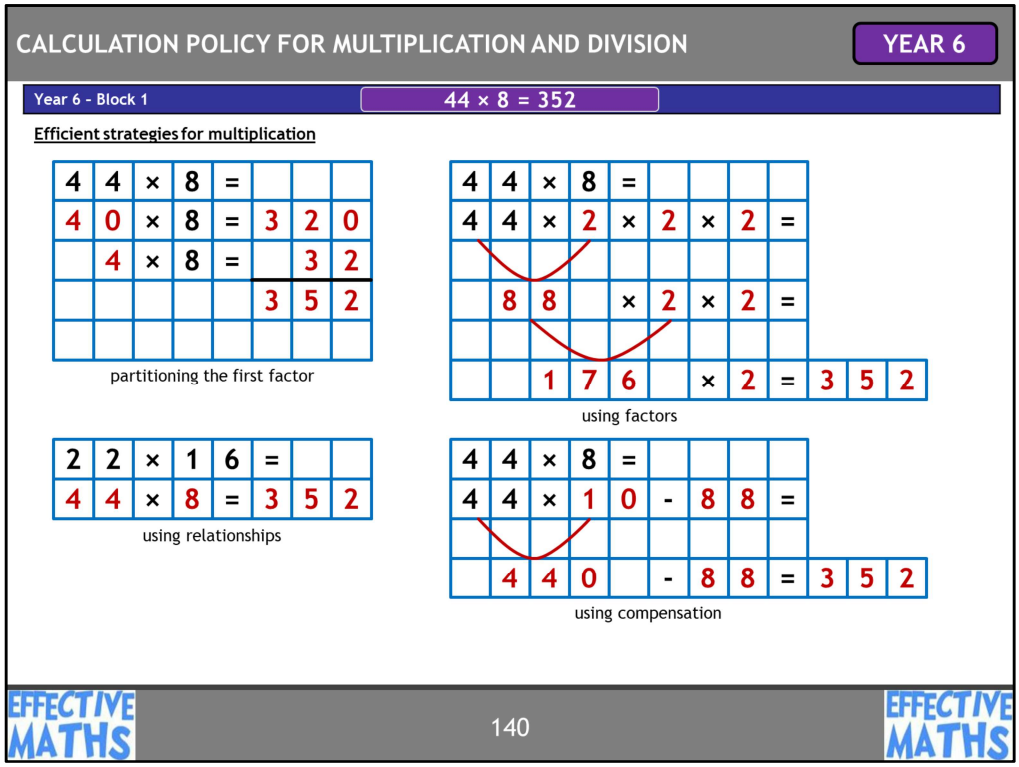


BLOCK 1
× AND ÷ UNIT 1

7 × table (r)
Revision of the 7 × table consolidates understanding from earlier year groups. This includes the distributive property of multiplication, through partitioning arrays:
6 × 7 = 5 × 7 + 1 × 7.
The distributive property allows a factor in a multiplication expression to be decomposed into two or more numbers, and those numbers can be multiplied by the other factor in the multiplication expression.

Children's understanding of the commutative property is developed through interpreting representations on multiplication grids in two ways, eg:
6 × 7 = 42
7 × 6 = 42

Understanding about the multiplication grid is deepened through challenging tasks involving finding missing products on parts of multiplication grids.



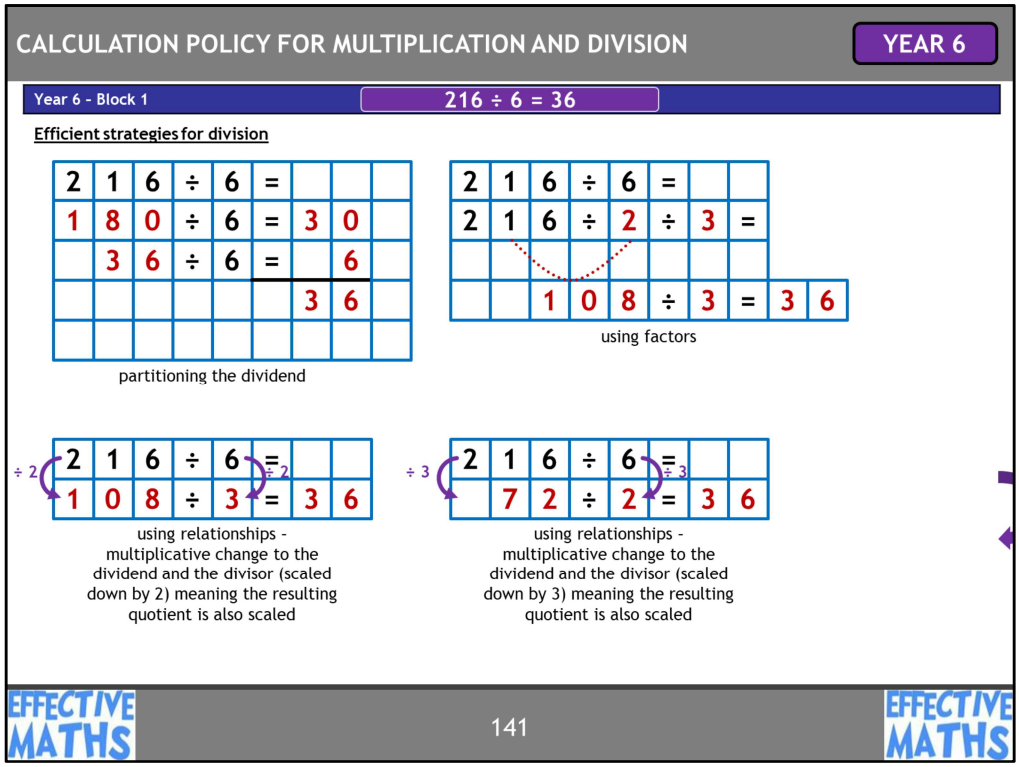
Efficient strategies for multiplication

Some calculations, often those with larger numbers, may be best solved with column methods. Understanding about how multiplication works is enhanced through familiarity with a range of methods, which also support mental calculation with smaller numbers.

Efficient strategies for multiplication include:

- column methods;
- partitioning methods;
- factors;
- relationships;
- compensation.

Certain calculations will lend themselves more readily to one or more of the above, so encouraging proficiency in more than one method is important. It also deepens understanding.

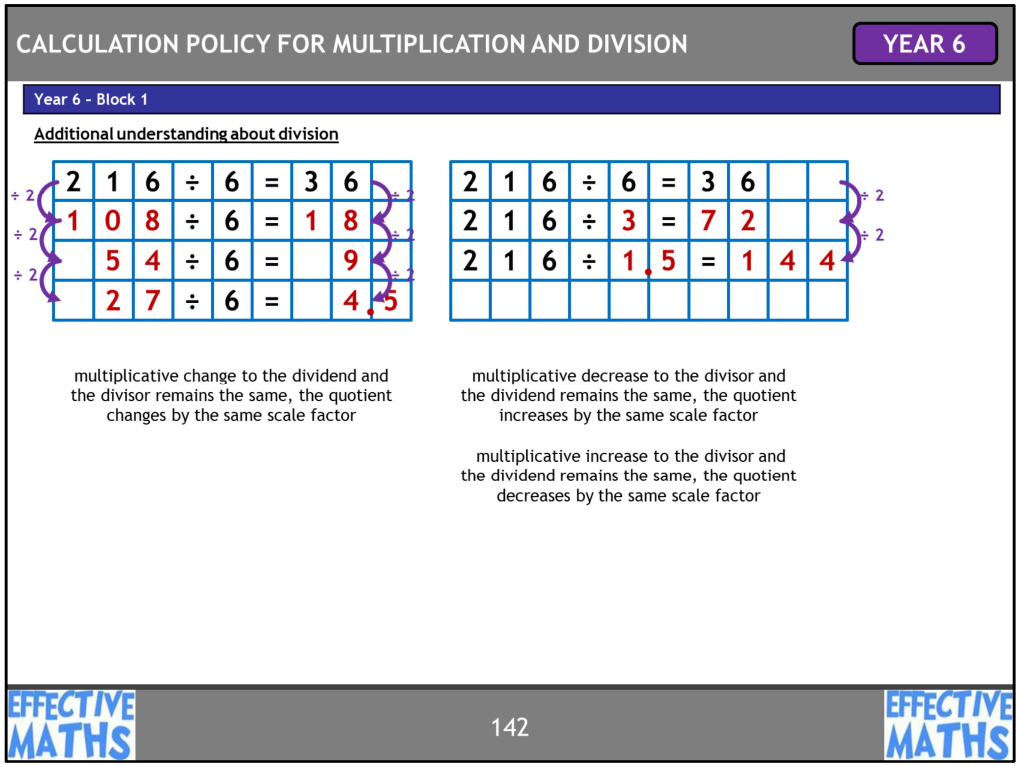


Efficient strategies for division

As with multiplication, some calculations, often those with larger numbers, may be best solved with column methods. Understanding about how division works is enhanced through familiarity with a range of methods, which also support mental calculation with smaller numbers.

Efficient strategies for division include:

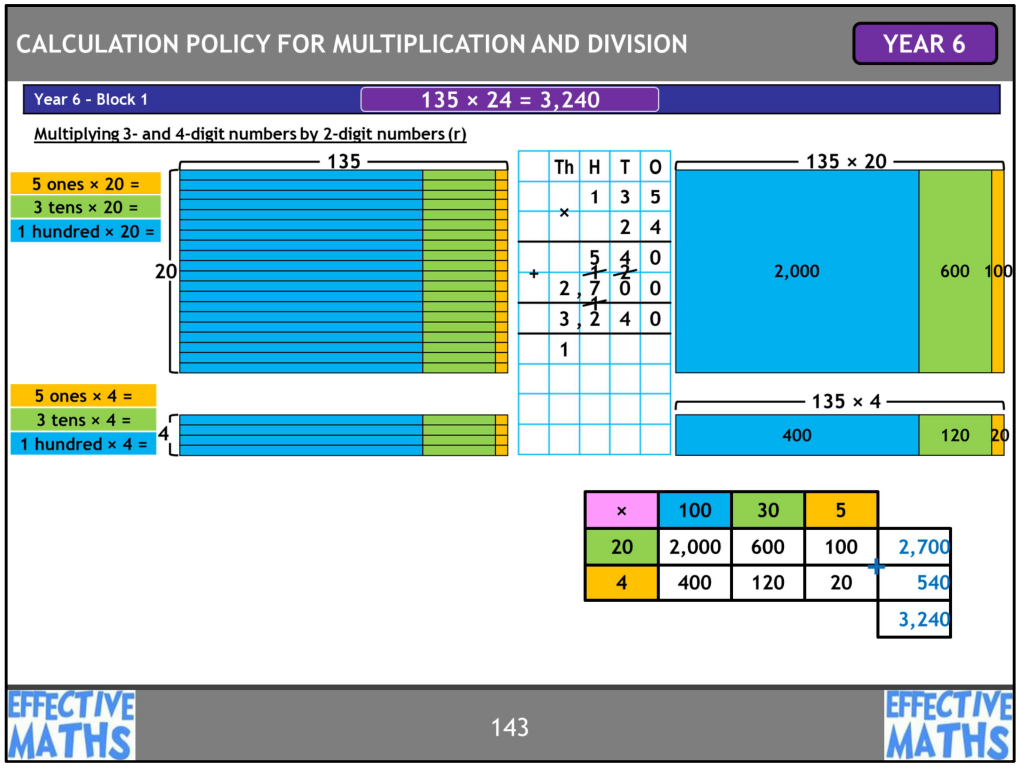
- column methods;
- partitioning methods;
- factors;
- relationships.



Additional understanding about division

Children have learnt about multiplicative change to the dividend **and** the divisor meaning the resulting quotient changes by the same scale factor.
They also learn that:

- if there is a multiplicative change to the dividend and the divisor remains the same, the quotient changes by the same scale factor;
- but if there is a multiplicative decrease to the divisor and the dividend remains the same, the quotient increases by the same scale factor;
- and if there is a multiplicative increase to the divisor and the dividend remains the same, the quotient decreases by the same scale factor.

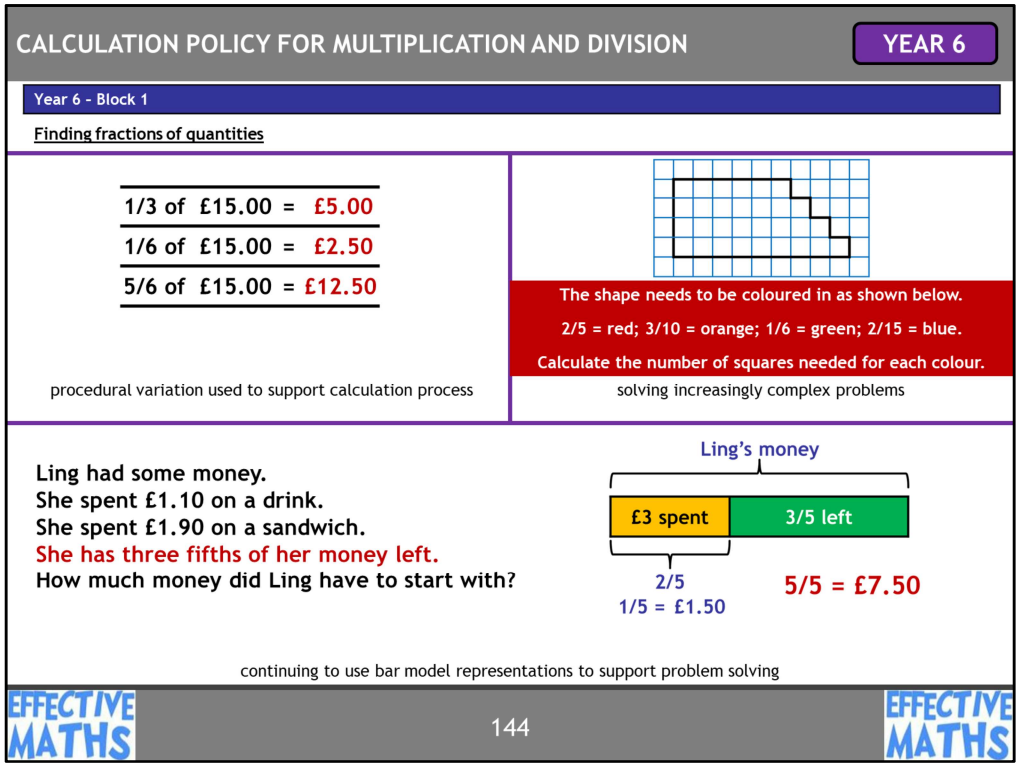


Multiplying 3- and 4-digit numbers by 2-digit numbers (r)

Unit 1 ends with work to consolidate understanding of long multiplication. Calculations are represented using arrays to ensure conceptual understanding of the multiplication process and attribute meaning to the long multiplication procedure. The array on the left is used on its own and then alongside the formal algorithm for long multiplication. The process for each is the same:
multiply the ones; multiply the tens; multiply the hundreds.
Accurate use of language is key. Children are very familiar with multiplying by ones in the column layout, eg:
5 ones × 4 = 20 ones = 2 tens = 20;
3 tens × 4 = 12 tens = 120;
1 hundred × 4 = 4 hundreds.

They also have considerable experience of multiplying by multiples of ten, but not recording in the column layout. Again, accurate use of language is key:
5 ones × 20 = 100 ones = 1 hundred = 100;
3 tens × 20 = 60 tens = 6 hundreds = 600;
1 hundred × 20 = 20 hundreds = 2000.

The grid method continues to be used. Whilst it is not the prime strategy, children are encouraged to make connections between the grid representation and the algorithm for long multiplication.

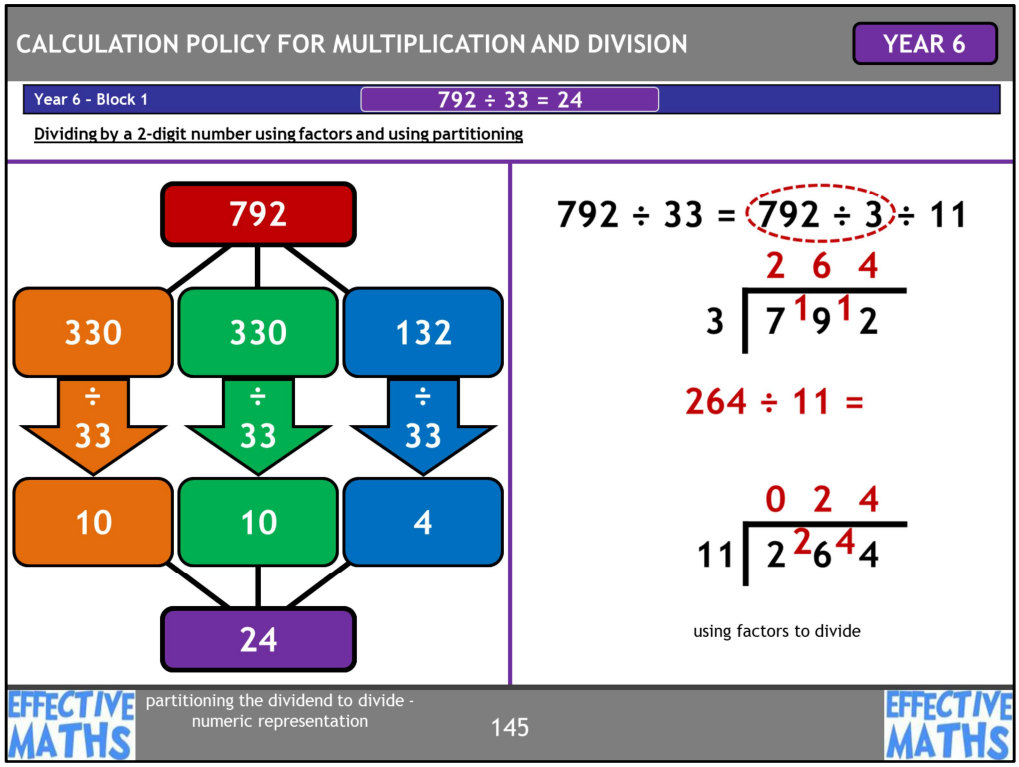


BLOCK 1
FRACTIONS UNIT 1

Finding fractions of quantities

Children have had lots of experience of finding unit fractions of quantities and, from Year 4, finding non-unit fractions of quantities. The procedure for finding fractions of quantities should be secure.

In Year 6 the emphasis is largely on solving problems involving non-unit fractions of quantities. Intelligent calculation practices are also promoted. For example, finding five-sixths of £15 is not best done by dividing £15 by 6 and multiplying the result by 5. Finding one-sixth is far easier by finding one-third and then halving this to obtain one-sixth. Now five-sixths can be obtained.

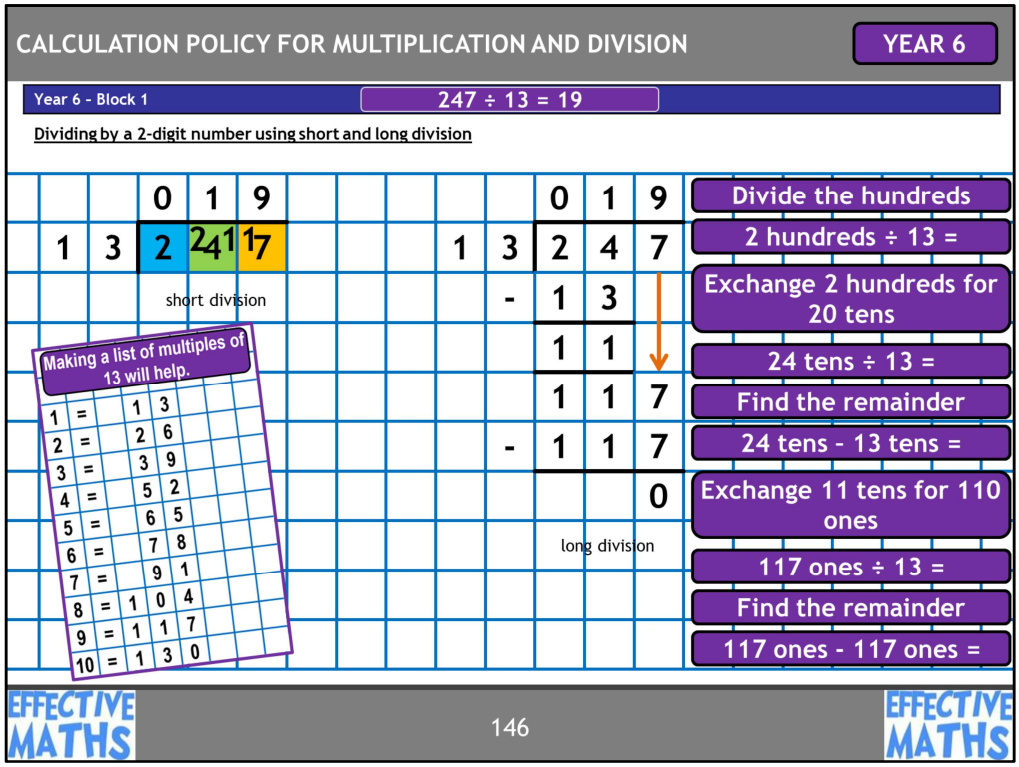


BLOCK 1
× AND ÷ UNIT 2

Dividing by a 2-digit number using factors and using partitioning

Partitioning supports conceptual understanding about division. The dividend is partitioned into parts that are divisible by the divisor. There is no set number of parts to partition the dividend into. In the example shown, using chunks of 330 makes things fairly straightforward.

Dividing by using factors can be effective for situations where the dividend is not a prime number. In the example shown factors of 33 are used. It does not matter which factor becomes the divisor first of all. Here, it makes sense to divide by 3 first and then 11. (NB Dividing 264 by 11 is done using the algorithm for short division.)



Dividing by a 2-digit number using short division

It is important that children realise that both short and long division can be used to divide when dividing with a 2-digit number as the divisor.

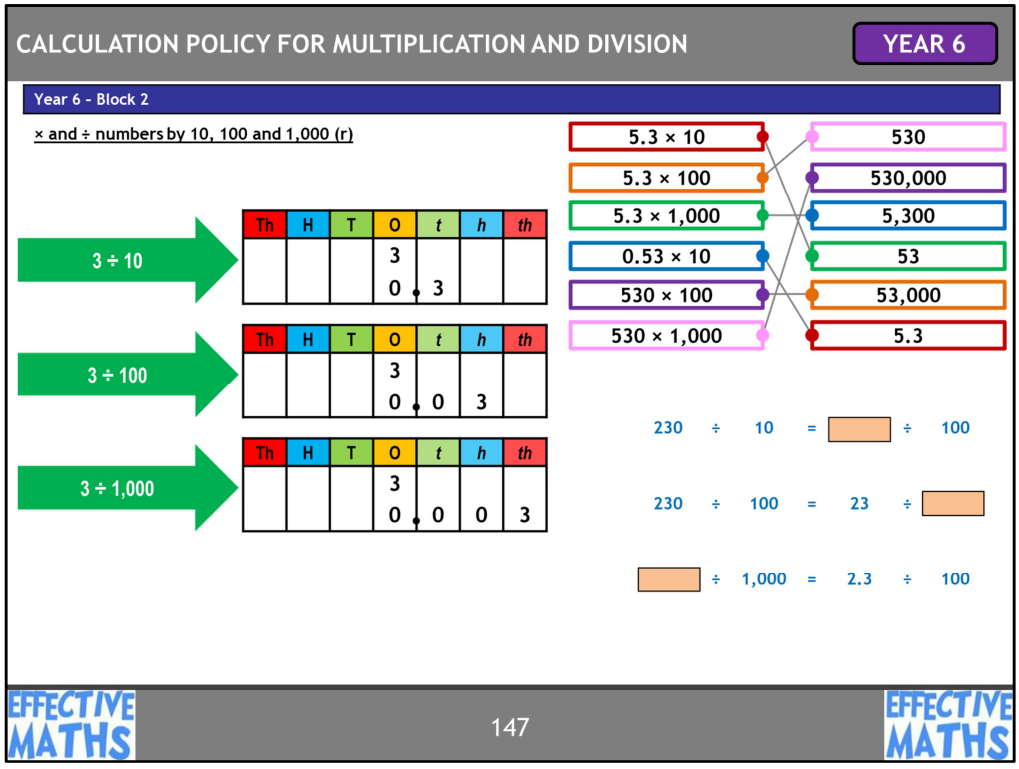
One of the challenges that arises when dividing by a 2-digit number is that we cannot use division facts from our known multiplication tables. To eliminate this challenge, encourage children to make lists of multiples of the divisor and remind them of simple strategies for making this list. For example, if the divisor is 13 we can add 10 and then add 3.

Use of language is key to ensuring conceptual understanding.

Language for 247 ÷ 13

2 hundreds ÷ 13 = … Not enough hundreds.
We need to exchange 2 hundreds for 20 tens.
24 tens ÷ 13 = 1 group of 13 tens with 11 tens left over.
Exchange 11 tens for 110 ones. We now have 117 ones ÷ 13.
Let's use the list of multiples of 13 to help find the answer.

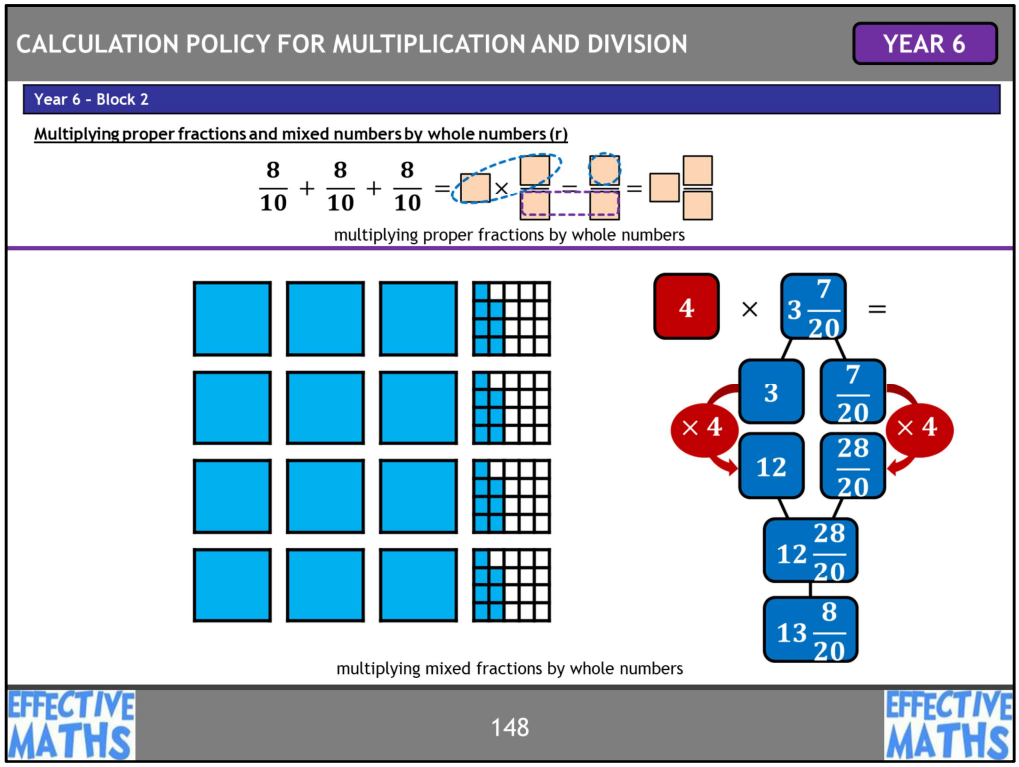
The language used is the same for both methods. The long division layout lets you see the remainders more easily – but this can also be confusing for some children. Where we show the regrouped digits is different in the two methods: in short division we write the regrouped digit/s in the bus stop; in long division we bring the digit down.



BLOCK 2
MONEY AND DECIMALS UNIT 1

× and ÷ numbers by 10, 100 and 1,000 (r)

Children revisit multiplying and dividing numbers with up to three decimal places by 10, 100 and 1,000. (This was first encountered in Year 5, × and ÷ unit 2.) The place value chart is used to highlight what happens to the digits when we multiply or divide by 10, 100 and 1,000. Activities require children to think carefully about multiplicative relationships when multiplying and dividing by 10, 100 and 1,000.



BLOCK 2
FRACTIONS UNIT 2

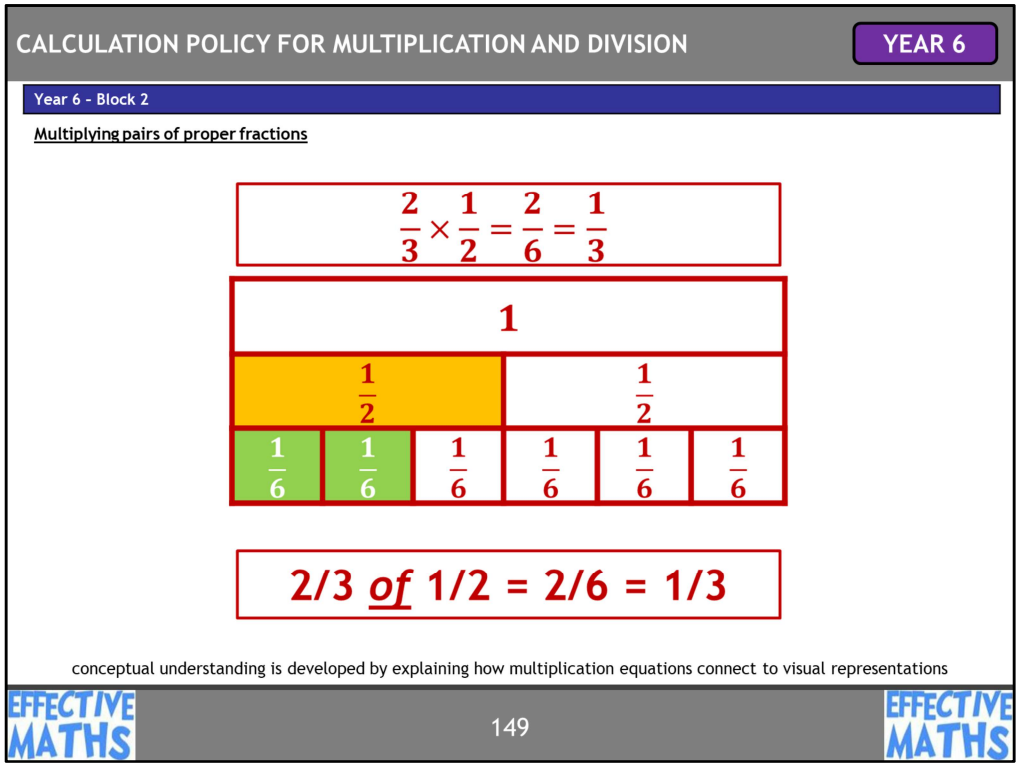
Multiplying proper fractions and mixed numbers by whole numbers (r)
Teaching about the multiplication of fractions begins by revisiting learning from Year 5 about multiplying fractions by whole numbers.

Multiplying proper fractions by whole numbers

The focus here is on understanding that we multiply the numerator by the whole number; we do not multiply the denominators. Repeated addition is used to help reinforce the concept: eight-tenths plus eight-tenths plus eight-tenths = twenty-four tenths = 2 and four-tenths

Multiplying mixed fractions by whole numbers

Partition 3 7/20 into whole parts and fractional parts.
Multiply the wholes.
Multiply the fractional parts.
Combine.
The initial combining results in the non-conventional format of a mixed number with an improper fractional part. In this instance, 12 28/20. Whilst this is structurally correct, explain that convention means we write the mixed number so the numerator is less than the denominator.



Multiplying pairs of proper fractions

Learning about multiplying pairs of proper fractions begins with addressing the misconception that multiplication makes things bigger. Teaching highlights that multiplication can make things bigger, result in no change or can make things smaller.

2 × 2 = 4

1 × 1 = 1

½ × ½ = ¼

Teaching highlights the varied vocabulary used for the multiplication symbol and teaches children that one word that can be used for it is 'of'.

½ of ½ = ¼

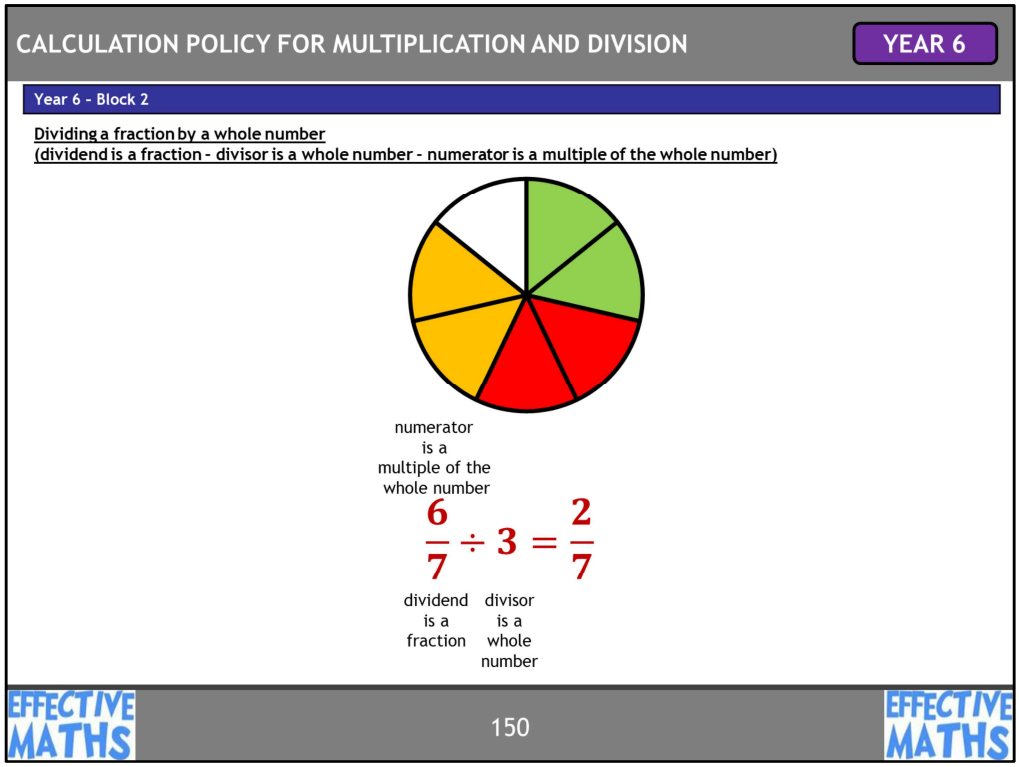
Children learn the rules for multiplying pairs of proper fractions.

[1] Multiply the numerators of the fractions to get the new numerator.

[2] Multiply the denominators of the fractions to get the new denominator.

[3] Simplify if needed.

Conceptual understanding is developed by explaining how multiplication equations connect to visual representations.

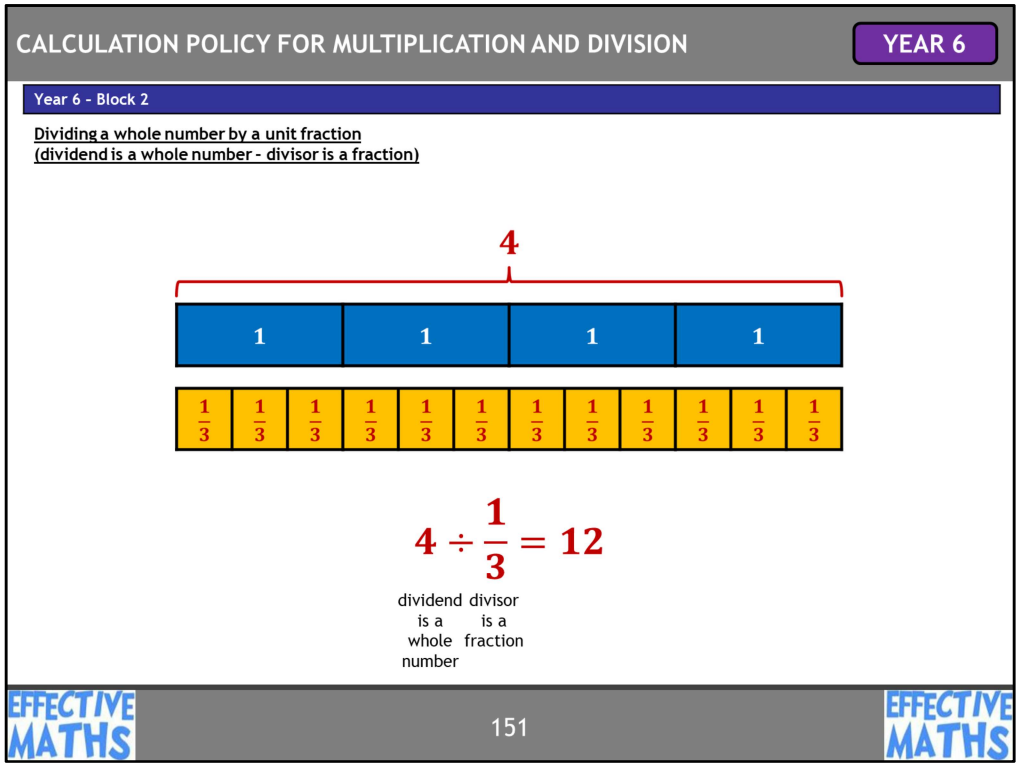


Dividing a fraction by a whole number

Learning to divide a fraction by a whole number begins with examples where the dividend is a fraction, the divisor is whole number and the numerator is a multiple of the whole number. For example:

6/7 ÷ 3.

Pictorial representations support conceptual understanding that we are not dividing the denominator. Children need to understand that the denominator tells us about the size of the parts and the numerator tells us how many parts there are.



Dividing a whole number by a unit fraction

Now the examples have the dividend as a whole number and the divisor is a fraction. For example:

4 ÷ 1/3.

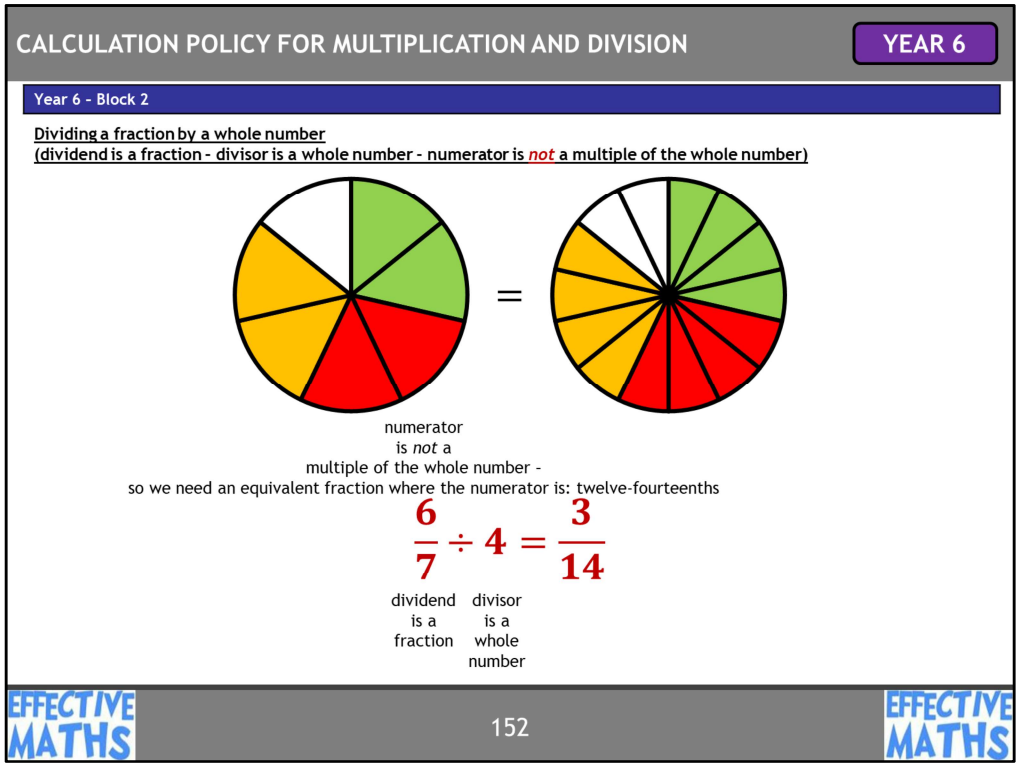
Pictorial representations support conceptual understanding. The key teaching point here is about visualising how many thirds are 'inside' the dividend.

Start by getting the children to think about how many thirds are in one. Then build that up to how many thirds are in two, three and four.

Highlight the relationship between the **whole number** and the **denominator**.

Finally, ask if it can be solved another way.

- Decimal equivalents. These will not be useful here as we are dividing by one-third. However they would be if the calculation were 4 ÷ ¼, for example.
- Scaling. Multiply the fraction by 3 to obtain 1, resulting in: 12 ÷ 1 = 12.

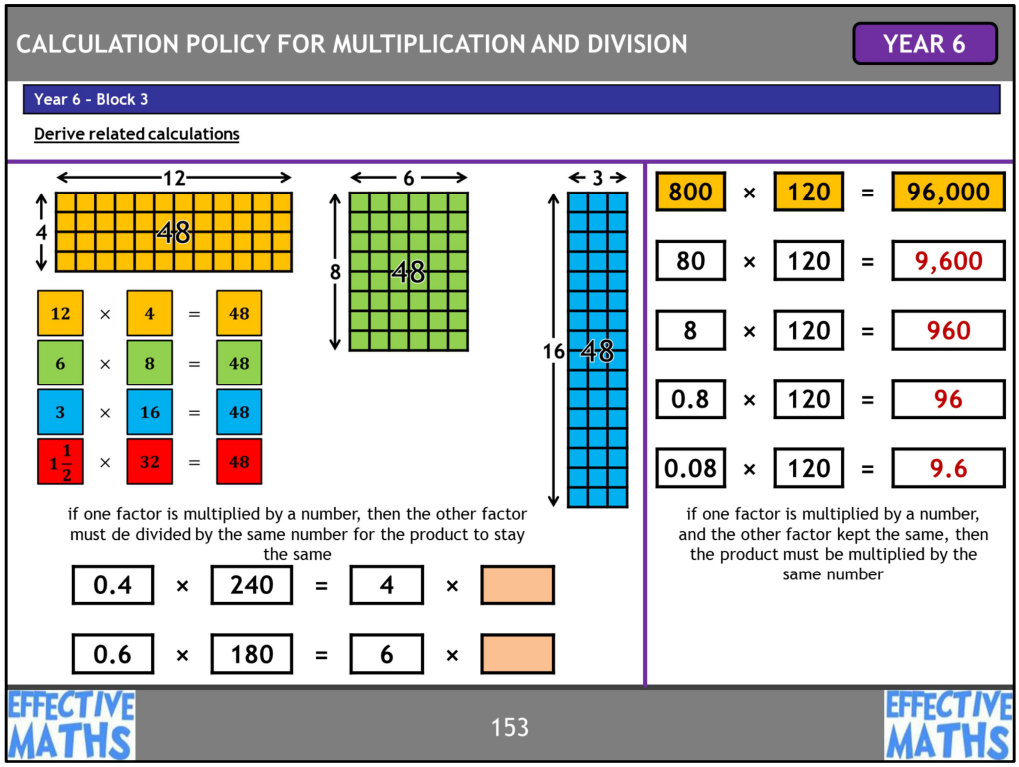


Dividing a fraction by a whole number

The final step in learning to divide a fraction by a whole number involves examples where the dividend is a fraction, the divisor is whole number and the numerator is ***not*** a multiple of the whole number. For example:

6/7 ÷ 4.

Teaching helps children to understand that we need to find an equivalent fraction (in this case 12/14) where we can divide the numerator by the denominator. Pictorial representations support conceptual understanding of this process.



BLOCK 3
CALCULATION UNIT

Derive related calculations

Children have used the compensation property of multiplication previously, for example, when recognising connections between multiplication table facts:
5 × 8 = 10 × 4.
They have also used it as method to simplify calculations:
22 × 16 = 44 × 8.
This learning is consolidated and children secure learning that if one factor is multiplied by a number, then the other factor must be divided by the same number for the product to stay the same. They use this knowledge to complete equations such as 0.4 × 240 = 4 × __ and, more generally, to help them simplify calculations.

Children have learnt to scale known number facts by 10, 100, one-tenth and one-hundredth. They know that if one factor is multiplied by a number, and the other factor kept the same, then the product must be multiplied by the same number. This knowledge is applied to solve missing number problems and also as a method to simplify calculations.