Calculation Policy 2022

Multiplication

Teaching for Mastery Calculation Policy

The aims of the policy

Mastery is for all children, and the aim of this policy is to ensure children leave Springwell Park with a secure understanding of the four operations and can confidently use both mental and written strategies in a range of contexts. It aims to ensure consistent strategies, model and images are used across our school to embed and deepen children's learning and understanding of mathematical concepts so children can:

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems.
- **Reason** mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.
- **Solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

How should this policy be used?

This policy is to support the teaching and planning of mathematics. This policy set out the progression of strategies and written methods children will be taught to develop their understanding of the four operations. Strategies set out in a Concrete, Pictorial and Abstract (CPA) approach to develop children's deep understanding and mastery of mathematical concepts. Children can use concrete objects to help them make sense of the concept or problem; this could be anything from real or plastic fruit, to straws, counters or cubes. This is then developed through the use of images, models and children's own pictorial representations before moving on to the abstract mathematics. Children will travel along the continuum again and again, often revisiting previous stages when a concept is extended. It is also worth noting that if a child has moved on from concrete to pictorial, it does not mean that the concrete cannot be used alongside the pictorial. Or if a child is working in the abstract, 'proving' something or 'working out' could involve use of the concrete or pictorial therefore building on prior learning. Then as children become more independent, they will be able to and encouraged to select strategies which are most efficient for the activity.

The strategies are separated into the 4 operations for easy reference. However, it is expected that addition and subtraction, and multiplication and division will be taught after each other to ensure that children are making connections and seeing relationships in their mathematics.

Children should be moved through the strategies at a pace appropriate to their age-related expectations as defined in the EYFS and National Curriculum. Teaching of the strategies rely on good levels of number sense, fluency and ability to reason mathematically. Children need to be supported to gain depth of understanding within the strategy through the CPA approach and not learn strategies as a procedure.

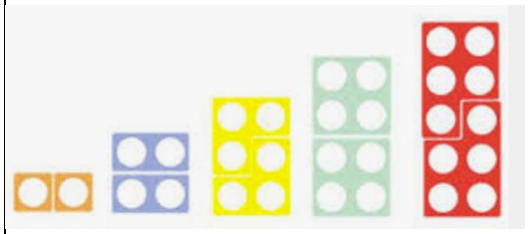
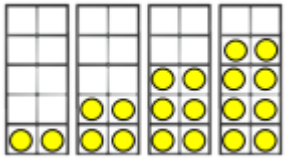
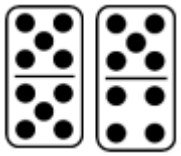
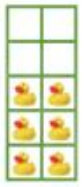
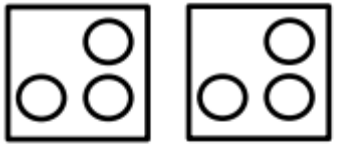
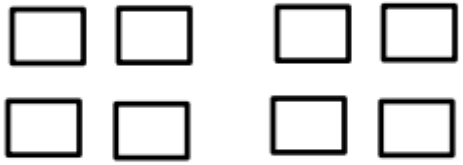
Multiplication

Nursery and Reception

By the end of Reception, children are expected to understand the concept of doubling and to be able to double a number up to 10. Before doubling can be introduced, children need to have a secure knowledge of counting, number facts and addition in order to double. Children are then introduced to the concept of doubling through practical games and activities, including the use of the outdoor areas. Children act out 'doubling' by physically add two equal groups together to find out the 'doubles' answer.

EYFS

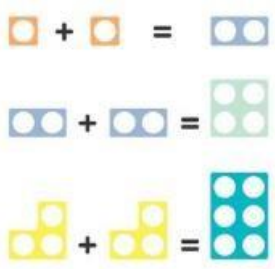
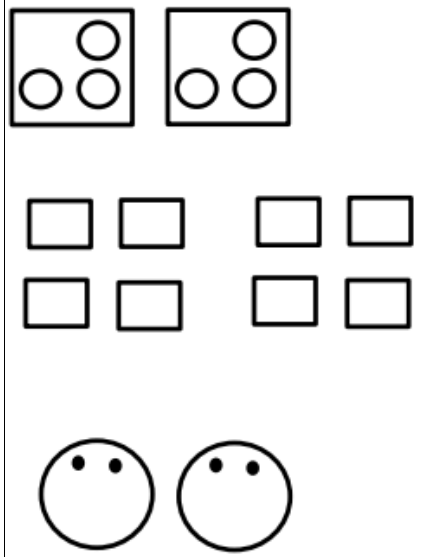
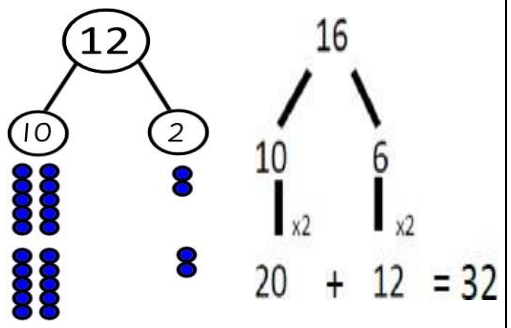
ELG Number Children at the expected level of development will:
Have a deep understanding of number to 10, including the composition of each number, subitise (recognise quantities without counting) up to 5, automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts
ELG Numerical Patterns Children at the expected level of development will:
Verbally count beyond 20, recognising the pattern of the counting system, compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity, explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed

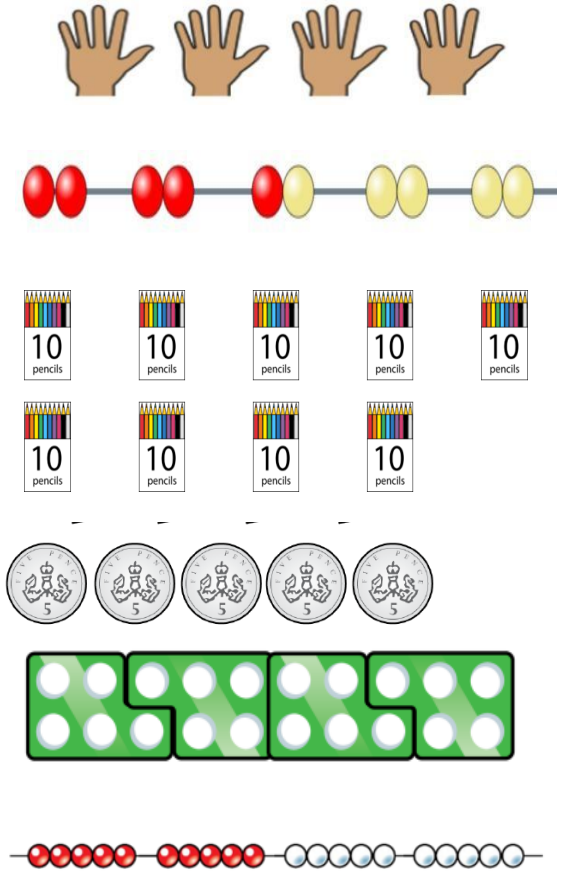
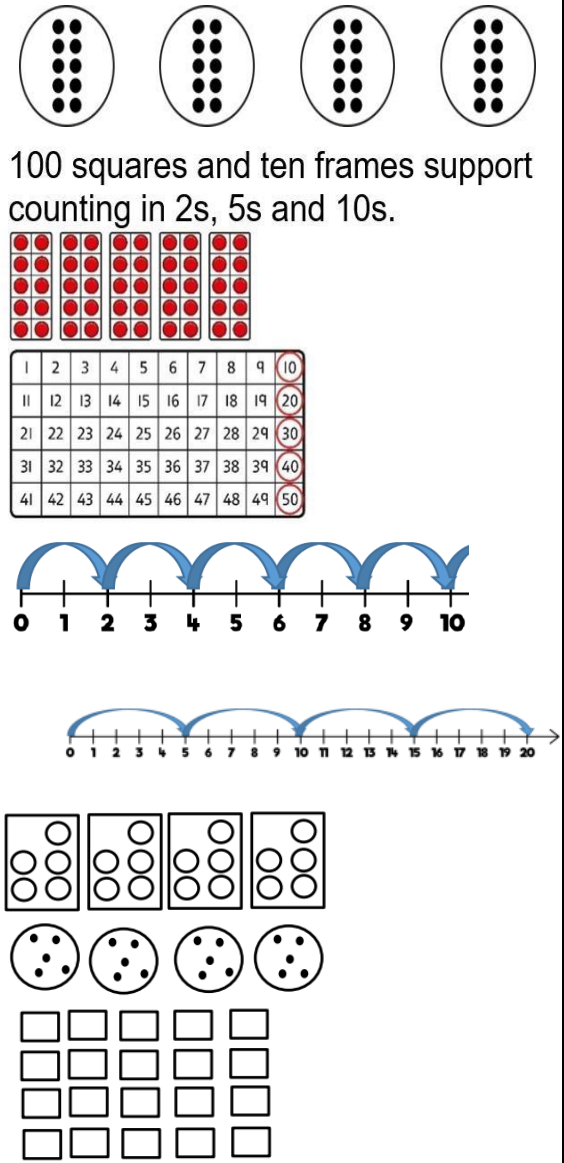
	Concrete	Pictorial	Abstract
Doubling The children will learn that double means 'twice as many'. They should be given opportunities to build doubles using real objects and mathematical equipment. Building numbers using the pairwise patterns on 10 frames helps the children to see the doubles. Mirrors and barrier games are a fun way for children to see doubles as they build and to explore early symmetry. Encourage children to say the doubles as they build them, e.g. Double 2 is 4 Provide examples of doubles and non-doubles for the children to sort and explain why. Play snap or matching pairs games using pictorial playing cards or dot cards. Encourage the children to say the doubles as they make them. The person with the most doubles or pairs of cards at the end wins the game	        	    	Double 2 is 4 Double 3 is 6 Double 4 is 8

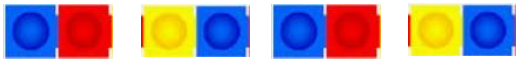
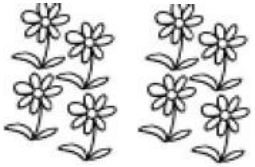
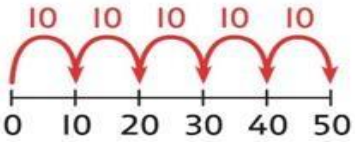
Year 1

Pupils should be taught to:

- solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

	Concrete	Pictorial	Abstract
Doubling strategies Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally	Use practical manipulatives to demonstrate doubling. 	Draw pictures and images to show how to double numbers. 	Partition a number and then double each part before recombining it back together. 

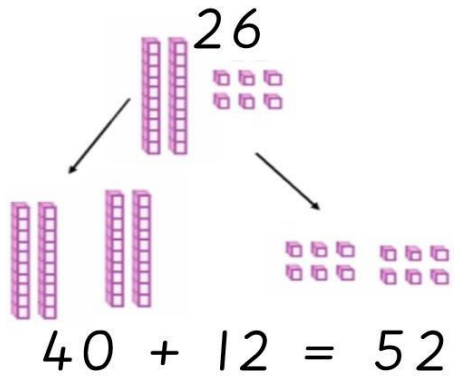
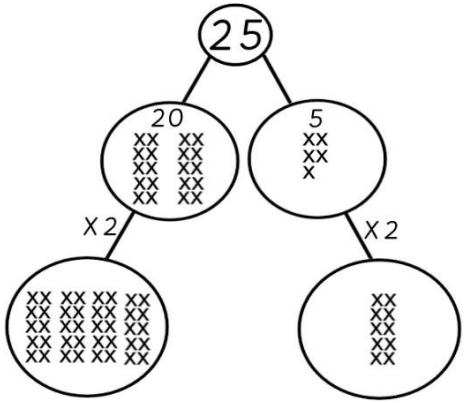
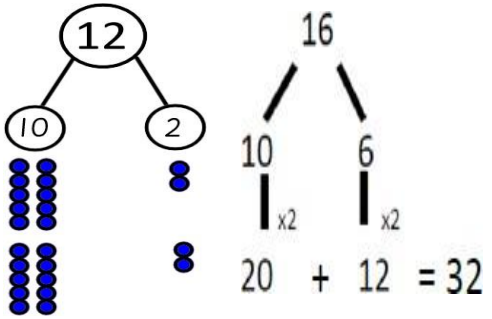
Counting in multiples (2, 5s, 10s)	Count the groups using skip counting. Children may track on their fingers. 	Children make representations to show counting in multiples.  100 squares and ten frames support counting in 2s, 5s and 10s.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0,2,4,6,8,10,12,14… 0,5,10,15,20,25,30… 1,10,20,30,40,50… Double 3 is 6 Double 5 is 10 $5+5+5+5=20$ One bag holds 5 apples. How many apples do 4 bags hold?

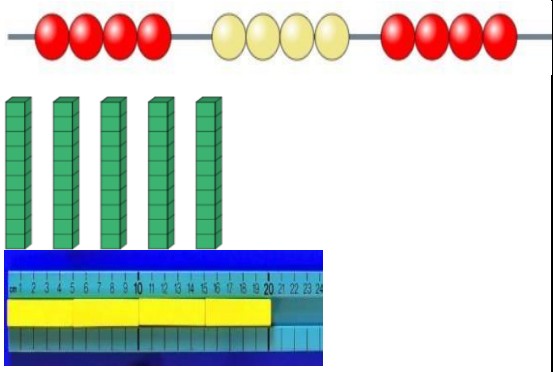
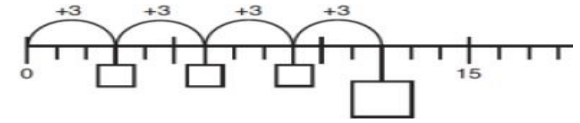
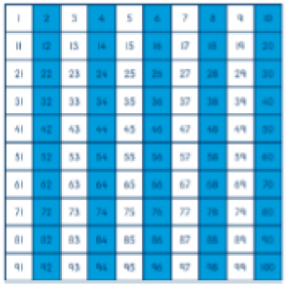
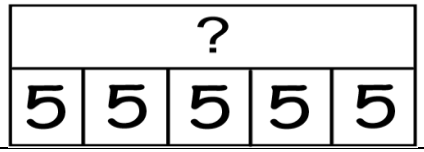
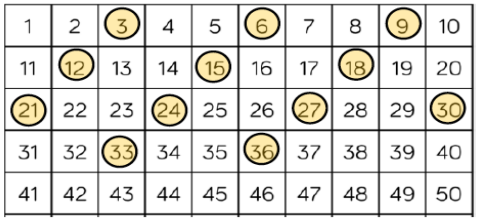
Making equal groups and counting the total	Use manipulatives to create equal groups.   □ x □ = 8 Recognise when groups are unequal.	Children draw and represent equal and unequal groups. Equal  Unequal 	Describe equal groups using words then digits / number sentences. Five equal groups of 10 is 50 10 + 10 + 10 + 10 +10 =50 

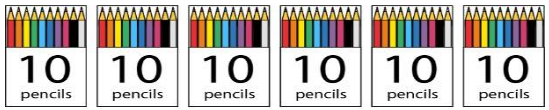
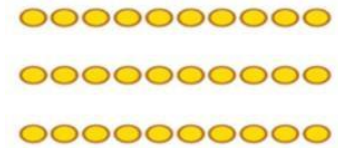
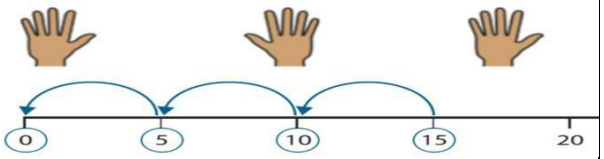
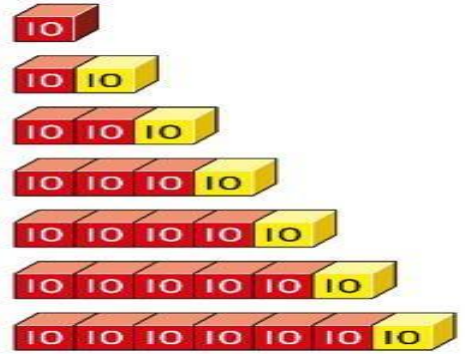
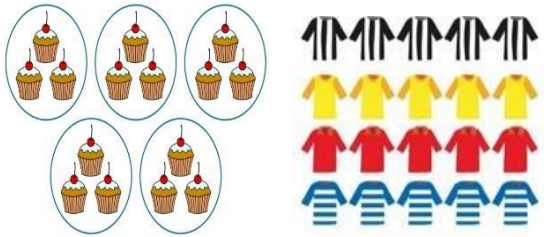
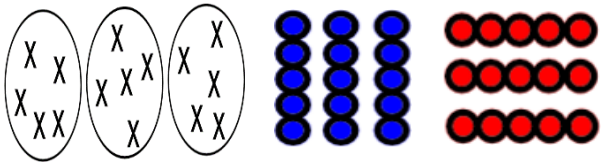
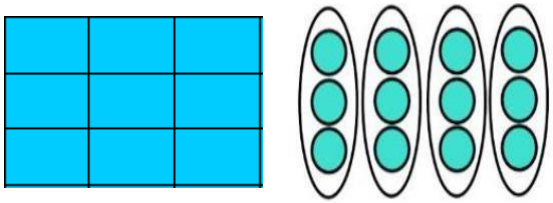
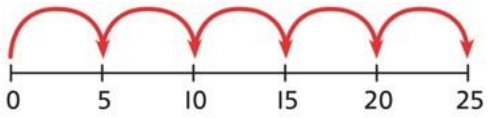
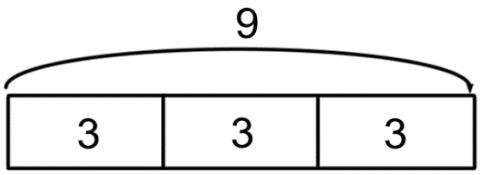
Year 2

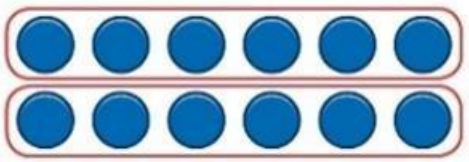
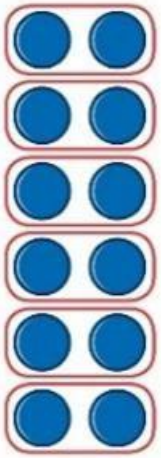
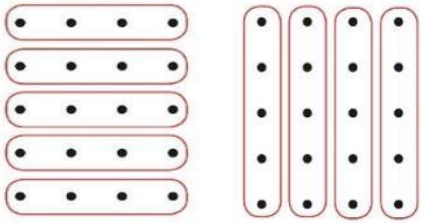
Pupils should be taught to:

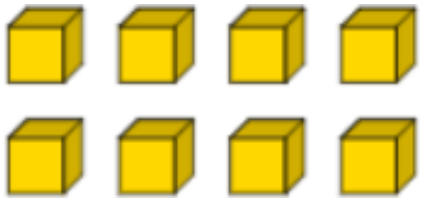
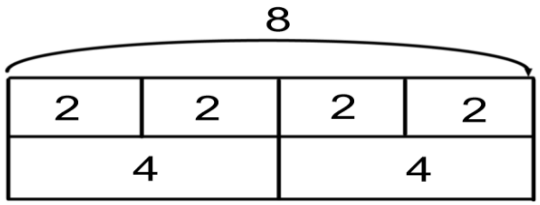
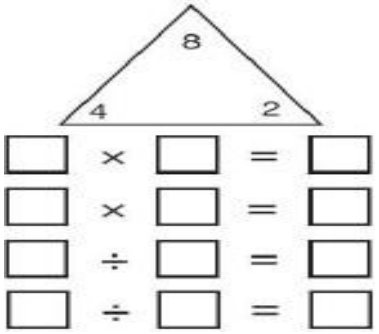
- recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs
- solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts

	Concrete	Pictorial	Abstract
Doubling strategies	Model doubling using place value and concrete equipment. 	Draw pictures and representations to show how to double numbers 	As year 1, partition a number and then double each part before recombining it back together. 

Counting in multiples from 0 (2's 3's 5's 10's) Using repeated addition	Count the groups using skip counting. Children may track on their fingers. Use bar models. 	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.    	Count in multiples of a number aloud. Use a number line and link to repeated addition as multiplication.  $5 + 5 + 5 = 15$ $3 \times 5 = 15$ Write sequences with multiples of numbers. 0,2,4,6,8,10 0,3,6,9,12,15 0,5,10,15,20,25,30 

Learning ×2, ×5 and ×10 table facts In Year 2, children are introduced to the multiplication symbol.	Develop an understanding of how to unitise groups of 2, 5 and 10 and learn corresponding times-table facts.  3 groups of 10…10,20,30 3 × 10 = 30  6 × 10 = 60 10 × 6 = 60 	Understand how to relate counting in unitised groups and repeated addition with knowing key times-table facts.  10 + 10 + 10 = 30 3 × 10 = 30   	Understand how the times tables increase and contain patterns.  
Using arrays to support understanding	Understand the relationship between arrays, multiplication and repeated addition.  4+4+4 4X3 / 3X4 	Children use images to represent arrays.  	Use number lines and bar models to support number sentences.  5 × 5 = 25 

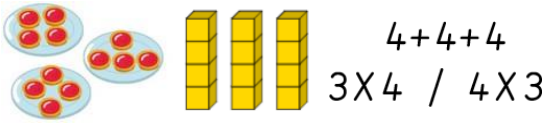
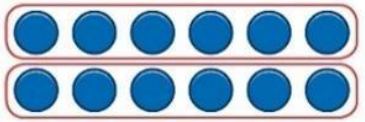
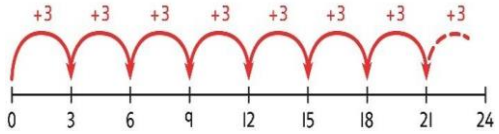
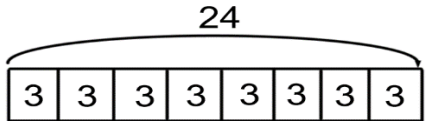
Multiplication is commutative	As above, use arrays to show that multiplication is commutative.  I can see: 3 groups of 6 6 groups of 3 6 X 3 = 18 / 6 X 3 = 18 Understand that the order does not affect the answer.	Rotate arrays to demonstrate that orientation does not change the total.  Number of groups = 2 Group size = 6 2 groups of 6 = 12 6 + 6 = 12 2 times 6 = 12 2 x 6 = 12  Number of groups = 6 Group size = 2 6 groups of 2 = 12 2 + 2 + 2 + 2 + 2 + 2 = 12 6 times 2 = 12 6 x 2 = 12	Use an array to write multiplication sentences and reinforce repeated addition.  4 + 4 + 4 + 4 + 4 = 20 5 + 5 + 5 + 5 = 20 4 × 5 = 20 5 × 4 = 20

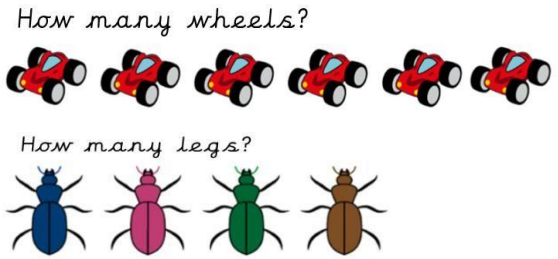
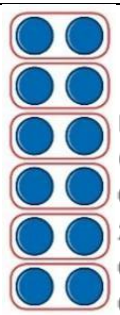
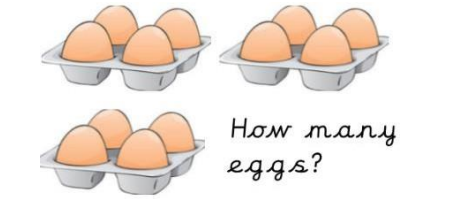
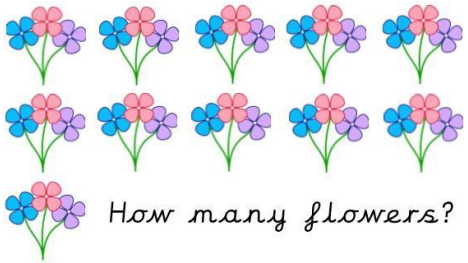
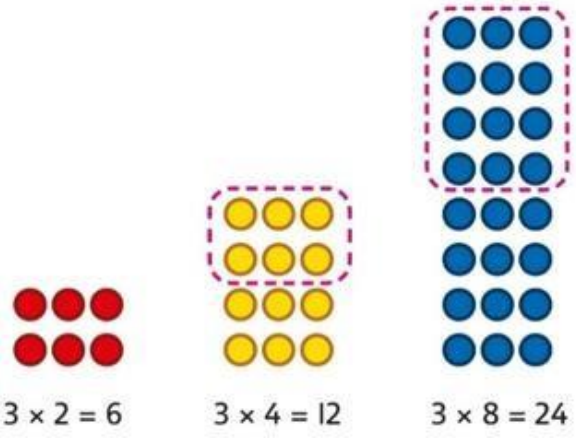
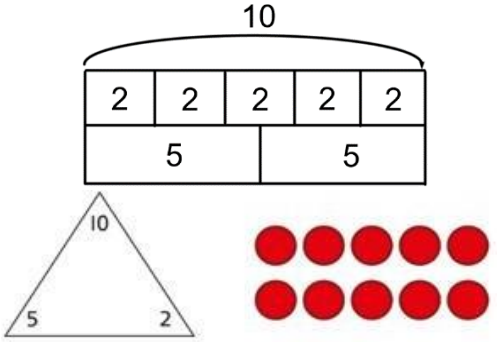
Using the inverse (taught alongside division so pupils learn how they relate)	Arrays to support understanding  Children to use STEM sentences to verbalise the links such as: - I see four lots of 2 / two lots of 4. - Two groups of 4 makes 8 - Four groups of 2 is 8 - I can share the cubes into 4 equal groups of 2 - 8 shared equally between 2 is 4.	Alongside concrete resources, children to explore fact families.   	Show related fact families. 2 X 4 = 8 8 = 2 X 4 4 X 2 = 8 8 = 4 X 2 8 ÷ 4 = 2 2 = 8 ÷ 4 8 ÷ 2 = 4 4 = 8 ÷ 2

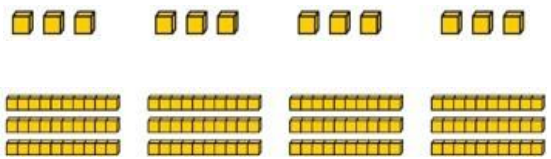
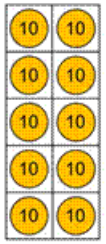
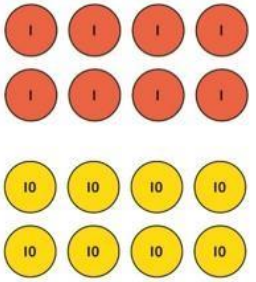
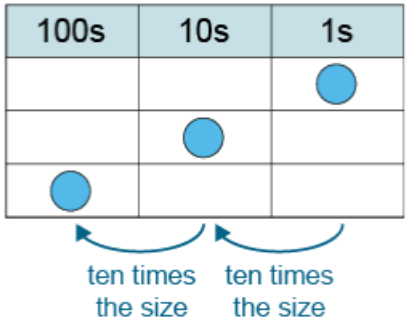
Year 3

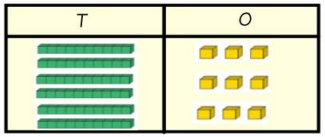
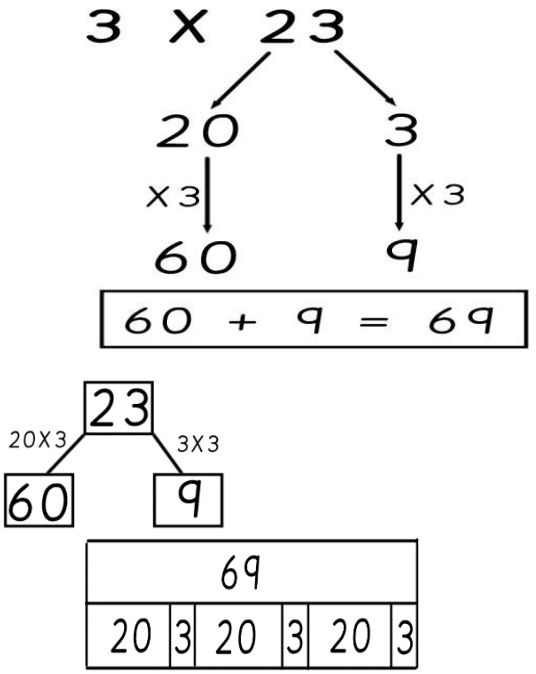
Pupils should be taught to:

- recall and use multiplication facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication, including positive integer scaling problems and correspondence problems in which n objects are connected to objects

	Concrete	Pictorial	Abstract
Equal grouping and repeated addition.	Continue to develop understanding of equal groups and relationship between repeated addition.  4+4+4 3X4 / 4X3 Arrays can be used to explore and model commutativity.  3 groups of 7 7 groups of 3	Use arrays to demonstrate commutativity. Rotate arrays to demonstrate that orientation does not change the total.  Number of groups = 2 Group size = 6 2 groups of 6 = 12 6 + 6 = 12 2 times 6 = 12 2 x 6 = 12	Understand the link between repeated addition and multiplication.  8 groups of 3 is 24. 3+3+3+3+3+3+3+3=24 8×3=24 Bar models to support 

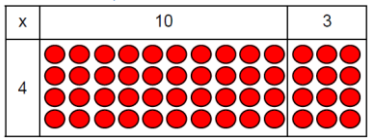
Using commutativity to support the understanding of times tables.	Understand how to use related facts to solve problems.  There are 6 groups of 4 wheels. There are 4 groups of 6 legs. I can use 6×4=24 to calculate both totals.	 Number of groups = 6 Group size = 2 6 groups of 2 = 12 2 + 2 + 2 + 2 + 2 + 2 = 12 6 times 2 = 12 6 x 2 = 12	Use known times table facts and how they relate to commutativity. If I need to work out 4 groups of 7, I know that 7 × 4 = 28 Therefore, I know that 4 groups of 7 = 28 and 7 groups of 4 = 28.
Understanding and using 2, 3, 4 and 8 times table.	 Learn times tables as groups of' but apply knowledge of commutativity.   I can use the 3X tables to work out both of these questions.	Recognise patterns between the 2X 4X and 8X through repeated doubling. 	Show fact families for known times tables.  2X5=10 / 10=2X5 5X2=10 / 10=5X2 10÷5=2 / 2=10÷5 10÷2=5 / 5=10÷2

Multiplying by multiples of 10	Explore the relationship between known times-tables and multiples of 10 using place value equipment.  4 groups of ones / 4 groups of 10 What is the same? What is different? **Grouping and exchange model**  *10 tens are equivalent to 1 hundred.*	Show how unitising 10s supports multiplying by multiples of 10.   *Tracks and Cuisenaire can be used* 4 groups of 2 ones are 8 ones 4 groups of 2 tens are 6 tens 4X2=8 4X20=80 **Scaling model**  	Use known times-tables to multiply multiples of 10. $4 \times 2 = 8$ $4 \times 20 = 80$ $40 \times 2 = 80$ $30 = 5 \times 6$ $300 = 50 \times 6$ $300 = 5 \times 60$

Multiplying a 2digit number by a single digit (partitioning)	Use place value equipment to show how to link partitioning a 2-digit number with multiplying. Each person has 23 pencils.  This is 2 tens and 3 ones each. 2 groups of ten / 3 groups of one. Base 10  Place Value Counters  	Use place value equipment alongside images to demonstrate partitioning.  	Partition the numbers and use addition to find totals. 23X3 20X3=60 3X3=9 60+9=69 56X4 50X4=200 6X4=24 200+20+4=224

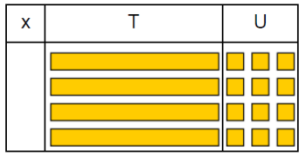
Multiplying with larger numbers (grid)

Show the link with arrays to first introduce the grid method.



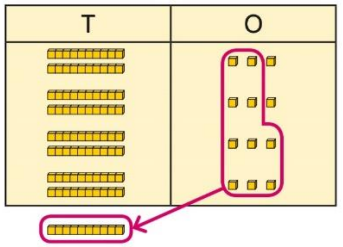
4 rows of 10
4 rows of 3

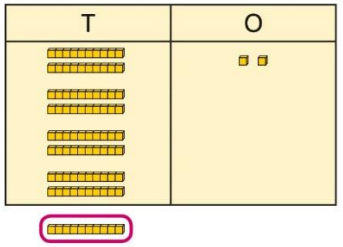
Move on to using Base 10 to move towards a more compact method.



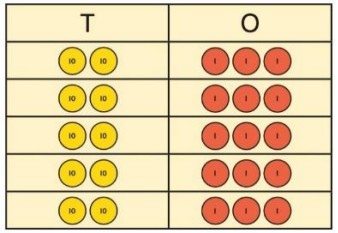
4 rows of 13

4 × 23 =?



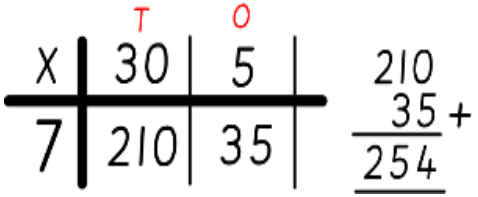


4 × 23 = 92



5 × 23 =?
5 × 3 = 15
5 × 20 = 100
5 × 23 = 115

Show the clear addition alongside the grid.



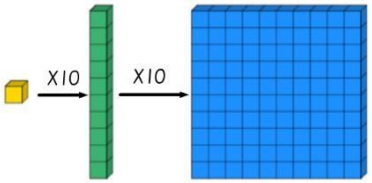
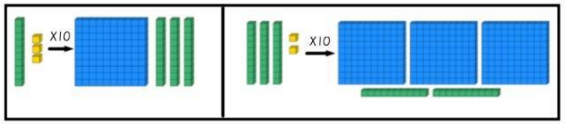
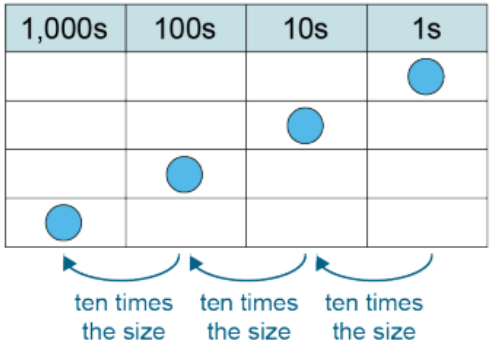
Only when pupil secure in grid method)

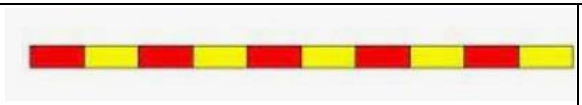
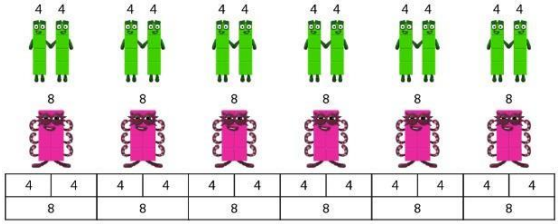
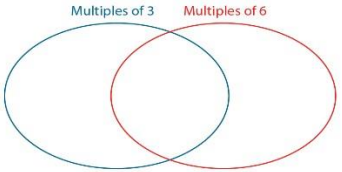
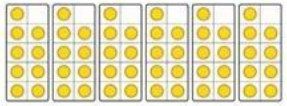
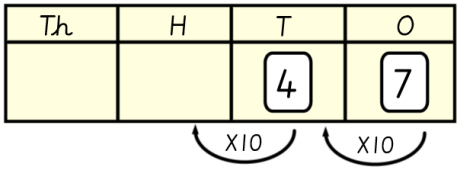
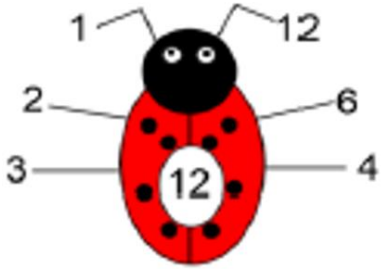
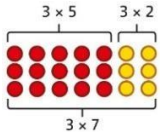
```
   T  O
   3  5
x     7
 2  4  5
 3
```

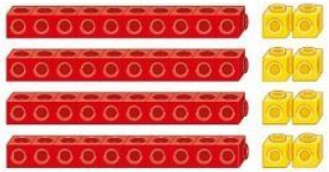
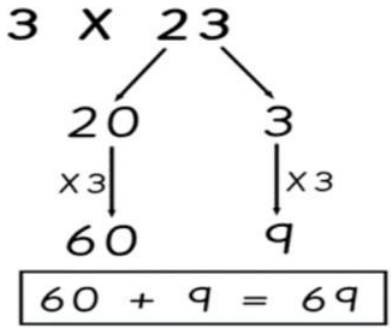
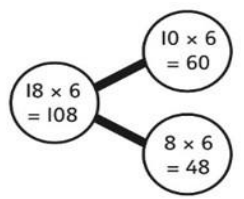
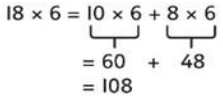
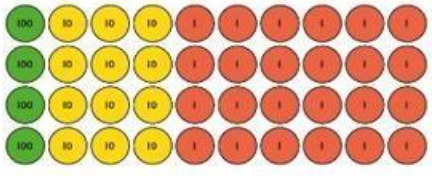
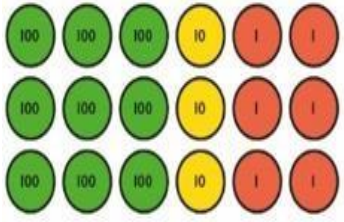
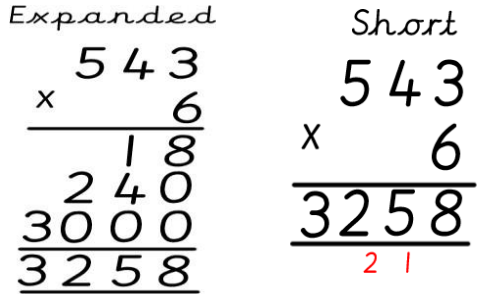
Year 4

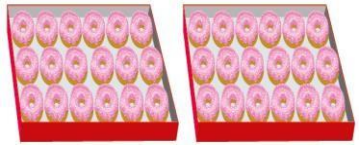
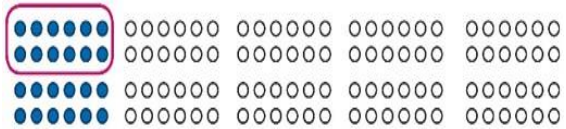
Pupils should be taught to:

- recall multiplication facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply mentally, including multiplying by 0 and 1, multiplying together 3 numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

	Concrete	Pictorial	Abstract
Multiplying by multiples of 10 and 100	Use unitising and place value to understand how to multiply by multiples of 1, 10 and 100.   Grouping and exchange model  "10 hundreds is equal to 1 thousand."	Use unitising and place value equipment to understand how to multiply by multiples of 1, 10 and 100.  Scaling model  	Use known facts and understanding of place value and commutativity to multiply mentally. 4 × 7 = 28 4 × 70 = 280 40 × 7 = 280 4 × 700 = 2,800 400 × 7 = 2,800

Understand times tables up to 12X12 (links to division)	 Spot patterns within times tables...  5 × 1 = 5 5 × 0 = 0  ...including focusing on multiplying by 1 and 0  	Represent the relationship between the 9 and 10 times table.   Represent the ×11 table and ×12 tables in relation to the ×10 table.  2 × 11 = 20 + 2 3 × 11 = 30 + 3 4 × 11 = 40 + 4  4 × 12 = 40 + 8 Factor Pairs/Factor Bugs  	Explore counting patterns and links between times tables. Understand links between the ×3, ×6 and ×9 table 5 × 6 is double 5 × 3 ×5 table and ×6 table I know that 7 × 5 = 35 so, I know that 7 × 6 = 35 + 7. ×5 table and ×7 table 3 × 7 = 3 × 5 + 3 × 2  ×9 table and ×10 table 6 × 10 = 60 6 × 9 = 60 − 6

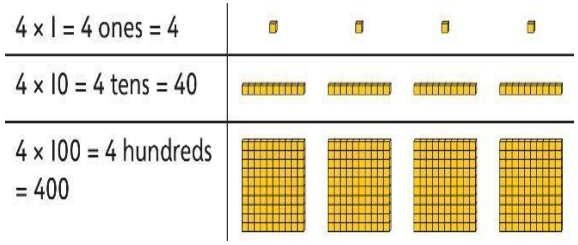
Using partitioning to multiply (leading to column multiplication)	Make multiplications by partitioning.  4×12 is 4 groups of 10 and 4 groups of 2. 4 × 12 = 40 + 8 40+ 8 = 48	Understand how multiplication and addition are related through addition.  20+20+20 3+3+3	Use partitioning to multiply 2-digit numbers by a single digit. 18 × 6 = ?   18 × 6 = 10 × 6 + 8 × 6 = 60 + 48 = 108
Column multiplication (2- and 3-digit numbers by a single digit) Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge. When moving to 3- digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.	Use place value equipment to make multiplications. 4X136  There are 4 × 6 ones... 24 ones There are 4 × 3 tens ... 12 tens There are 4 × 1 hundred ... 4 hundred 24 + 120 + 400 = 544	Use place value equipment alongside expanded and short column method. 	Use expanded leading to the formal column method for up to 3-digit numbers multiplied by a single digit. 

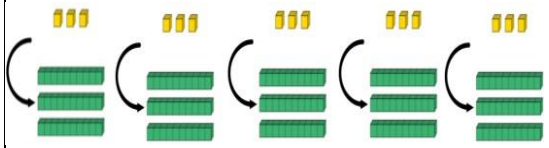
Multiplying more than 2 numbers.	Represent situations where 3 numbers are multiplied.  6X3X2	Commutativity can be used to multiply in different orders.  2×6×10=120 12×10= 120 10×6×2=120 60×2=120	Use knowledge of factors to simplify multiplications $24 \times 5 = 12 \times 2 \times 5$ 12 × 2 × 5 = 12 × 10 = 120 So, 24 × 5 = 120

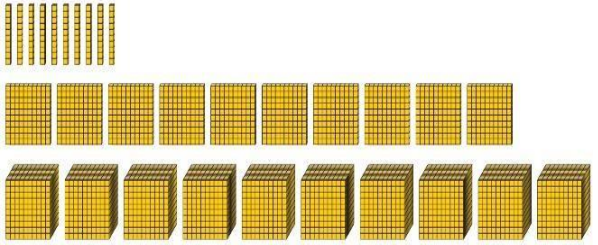
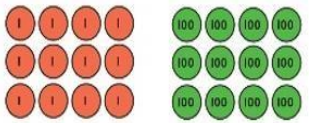
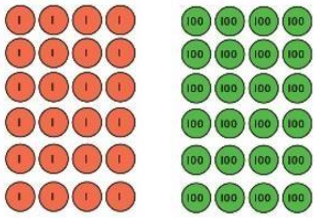
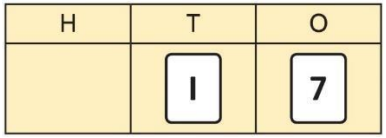
Year 5

Pupils should be taught to:

- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply numbers mentally, drawing upon known facts
- multiply whole numbers and those involving decimals by 10, 100 and 1,000
- solve problems involving multiplication, including using their knowledge of factors and multiples, squares and cubes
- solve problems involving multiplication including understanding the meaning of the equal's sign

<table>
<tr><th></th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Multiplying by 10,100 and 1000</td>
<td>Use place value equipment to multiply by 10, 100 and 1,000 by unitising.
 


5 groups of 3 ones are 15 ones.
5 groups of 3 tens are 15 tens.

So, I know that 5 groups of 3 thousands would be 15 thousands.</td>
<td>Understand the effect of repeated multiplication by 10.
 
 
4×3=12
4×300=1,200
 
6×4=24
6×400=2,400</td>
<td>Understand how exchange relates to the digits when multiplying by 10, 100 and 1,000.
 

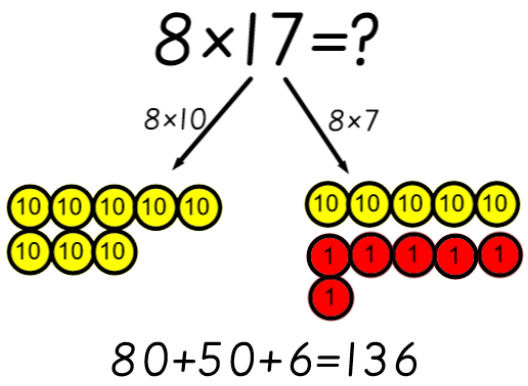
17×10 = 170
17×100 = 17×10×10 = 1,700
17×1,000 = 17×10×10×10 = 17,000

5×4=20
5×40=200
5×400=2,000
5×4,000=20,000
5,000×4=20,000</td>
</tr>
</table>

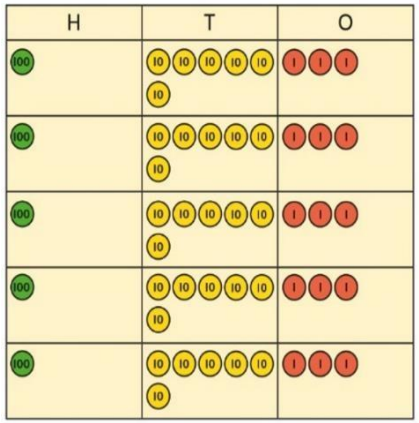
Multiplying up to 4-digits by a single digit

When multiplying 4- digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Explore how to use partitioning to multiply efficiently.



Represent using place value equipment alongside short column.



Short

$$\begin{array}{r} 163 \\ \times \quad 5 \\ \hline 815 \\ \hline 3\ 1 \end{array}$$

Use formal short column method.

Short

$$\begin{array}{r} 3296 \\ \times \quad 4 \\ \hline 13184 \\ \hline 1\ 3\ 2 \end{array}$$

Use other methods, such as grid, partitioning or area model, as checking strategy.

	100	60	3
5	100 × 5 = 500	60 × 5 = 300	3 × 5 = 15

Multiplying by two 2-digit numbers

Partition one number into 10s and 1s, then add the parts.

22X13

$$\begin{array}{r} 130 \\ +\ 130 \\ \quad\ 26 \\ \hline 286 \end{array}$$

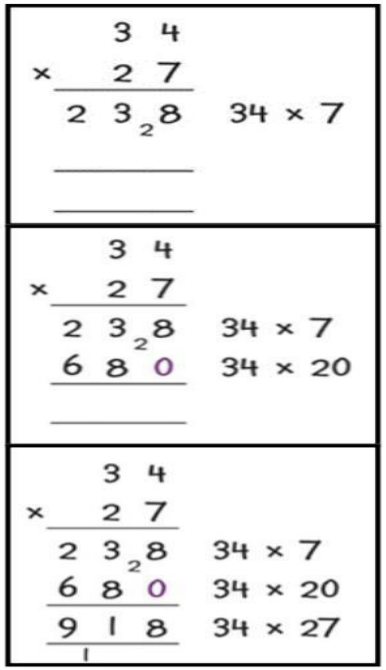
Use grid or area model and add the parts.

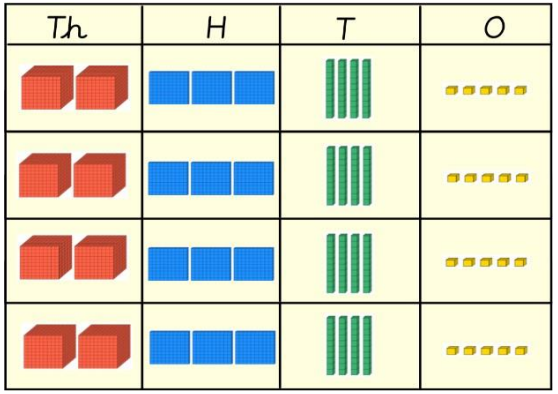
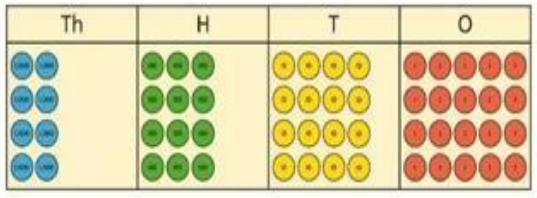
28x15

	20 m	8 m
10 m	20 × 10 = 200 m²	8 × 10 = 80 m²
5 m	20 × 5 = 100 m²	8 × 5 = 40 m²

200+100+80+4=420

Use long column multiplication, ensuring understanding of place value at each stage.



Multiplying up to 4-digits by a single digit	Use partitioning (see year 5) and place value equipment to explore multiplications. 4×2,345 / 2,345×4 	Use the short formal method alongside place value equipment as needed. 2345 × 4 9380 1 1 2 	Increasingly competent when using the short formal column to multiply. 3225 × 4 12900 1 2 Develop checking strategies, including the inverse. 3,000 200 20 5 4 | 12,000 800 80 20 12,000 + 800 + 80 + 20 = 12,900 3225 4 | 12'9'0'0 1 2

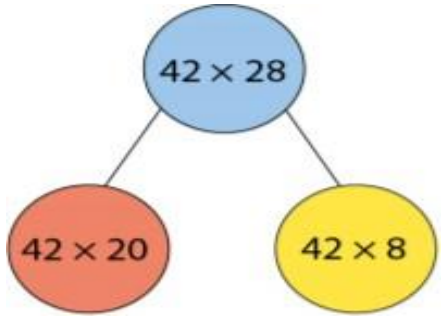
Multiplying up to 4-digits by a 2-digit number

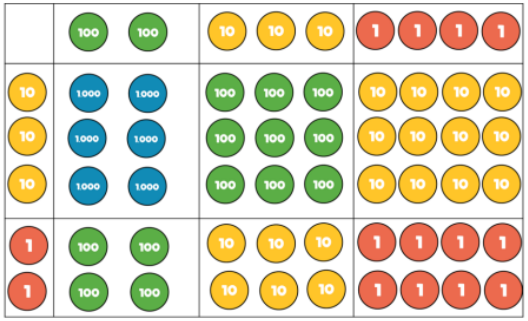
When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10. The grid method matches the area model as an initial written method before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

Children can continue to use the area model when multiplying 3- digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers. Children should now move towards the formal written method, seeing the links with the grid method.

This should be taught when short multiplication is secure.

Manipulatives can still be used but should not be necessary. Images can support process.





Formal long multiplication ensuring that place value is secure at each stage.

Step 1

	100s	10s	1s
		3	1
×		2	4
			4

Step 2

	100s	10s	1s
		3	1
×		2	4
	1	2	4

Step 3

	100s	10s	1s
		3	1
×		2	4
	1	2	4
			0

Step 4

	100s	10s	1s
		3	1
×		2	4
	1	2	4
		2	0

Step 5

	100s	10s	1s
		3	1
×		2	4
	1	2	4
	6	2	0

Step 6

	100s	10s	1s	
		3	1	
×		2	4	
	1	2	4	31 × 4
	6	2	0	31 × 20
	7	4	4	

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

Formal long multiplication method used with increasing confidence.

	100s	10s	1s
		2	7
×		2	3
		8	1
	5	4	0
	6	2	1

1

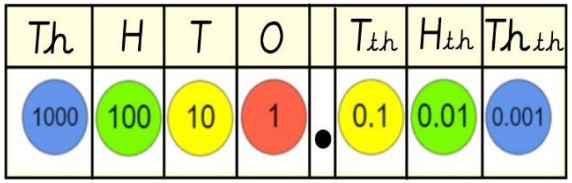
	1,000s	100s	10s	1s
		3	1	2
×			2	8
	2	4	9	6
	6	2	4	0
	8	7	3	6

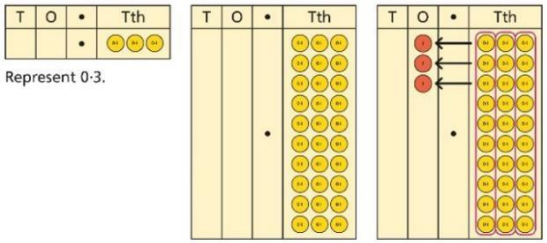
1

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

Multiplying decimals by 10,100 and 1000

Use place value equipment to explore and understand the exchange of 10 tenths, 10 hundredths or 10 thousandths.





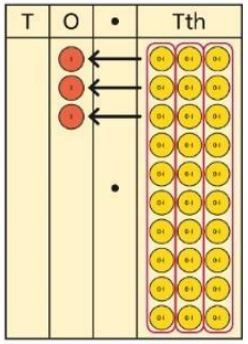
0·3 × 10 =? 0·3 is 3 tenths.
10 × 3 tenths are 30 tenths.
30 tenths are equivalent to 3 ones

Grouping and exchange model

"10 hundredths is equal to 1 tenth."

Represent multiplication by 10 as exchange on a place value grid.

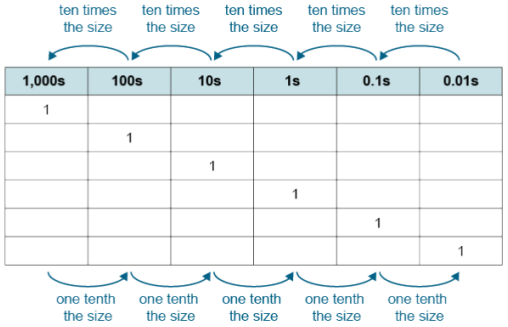
Understand how the exchange affects decimal numbers on a place value grid.



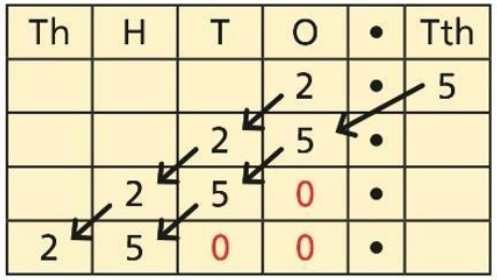
T	O	•	Tth
		•	3

T	O	•	Tth
	3	•	3

Scaling model



Understand how this exchange is represented on a place value chart.



$2.5 \times 10 = 25$

$2.5 \times 100 = 250$

$2.5 \times 1000 = 2500$

Use knowledge of multiplying by 10, 100 and 1,000 to multiply by multiples of 10, 100 and 1,000.

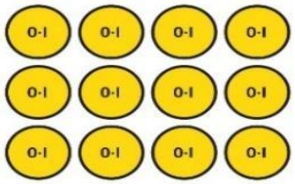
$8 \times 100 = 800$

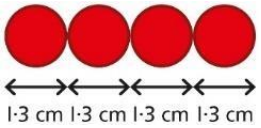
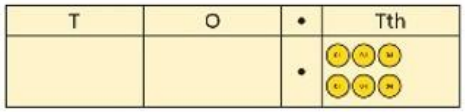
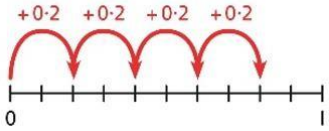
$8 \times 300 = 800 \times 3$

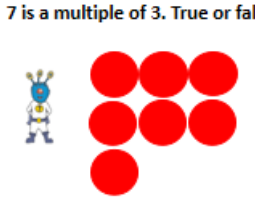
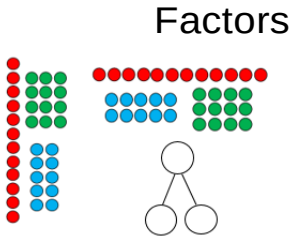
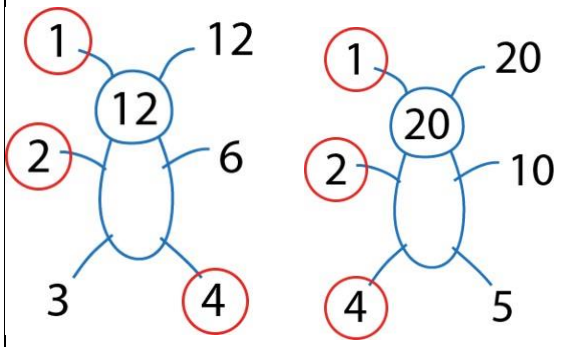
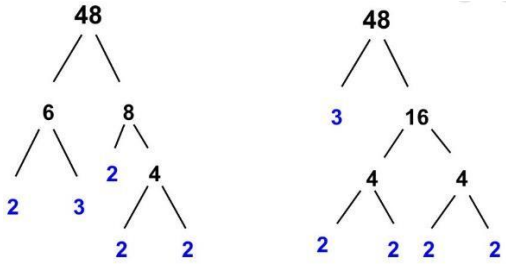
$= 2,400$

$2 \cdot 5 \times 10 = 25$

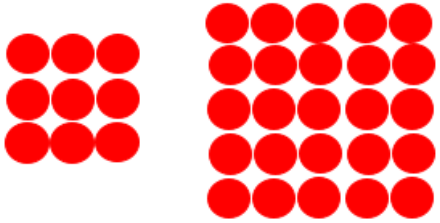
$2 \cdot 5 \times 20 = 2 \cdot 5 \times 10 \times 2 = 50$

<table>
<tr>
<td>Multiplying decimals</td>
<td>Explore decimal multiplications using place value equipment and in the context of measures.
 
3 groups of 4 tenths
4 groups of 3 tenths =12 tenths

 
1·3 cm 1·3 cm 1·3 cm 1·3 cm
4×1cm=4 cm
4×0·3 cm=1. 2 cm
4×1·3=4+1·2=5·2 cm</td>
<td>Understand the link between repeated addition and multiplication
 
 
Use known facts to multiply decimals.
4×3=12
4×0·3=1·2
4×0·03=0·12
20×5=100
20×0·5=10
20×0·05=1</td>
<td>Use partitioning or column method to multiply decimals.
3.19
x 8
25.52
1 7</td>
</tr>
<tr>
<td>Understanding factors, multiples, squares and cubes

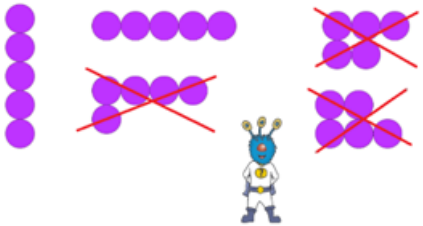
(Link with division)</td>
<td>Multiples
 
Create different arrays/ arrangements with counters or cubes to show its factors.
 
Factors of 12 : 1, 2, 3, 4, 6, 12.</td>
<td>Use images to explore factors and common factors.
  </td>
<td>Investigate factors and patterns.
For example: use factor trees to identify prime factors.
 
48 = 2 x 2 x 2 x 2 x 3</td>
</tr>
</table>

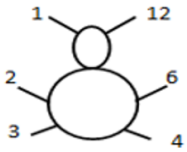
Square numbers



Prime Numbers

5 is a prime number. True or false?

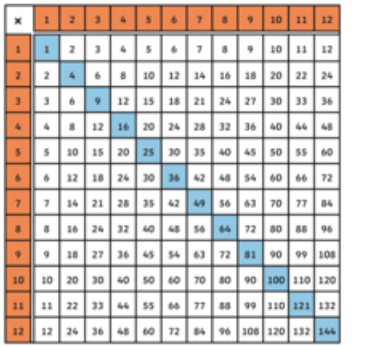




Factors of 12	
1	12
2	6
3	4

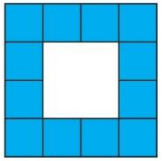
Factor Table

Square Numbers



$8 \times 8 = 64$

$8^2 = 64$



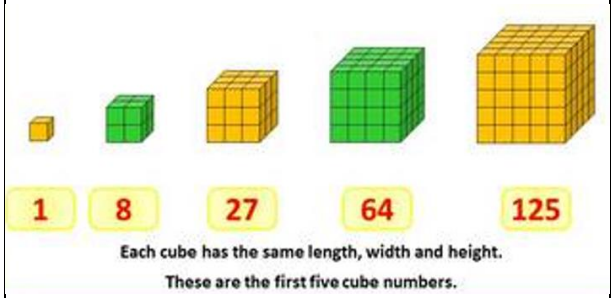
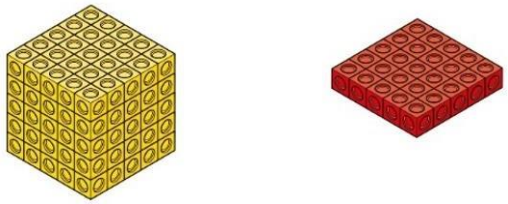
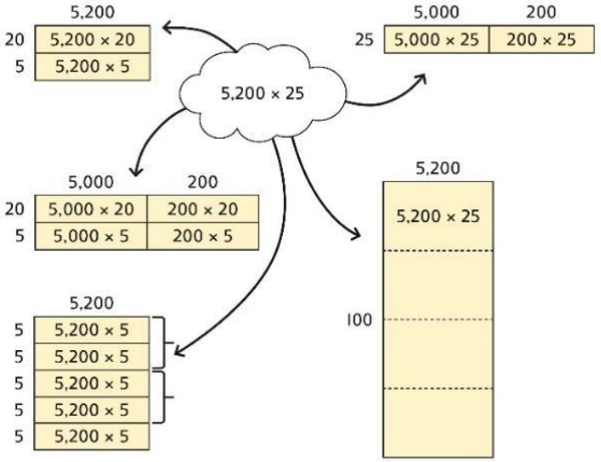
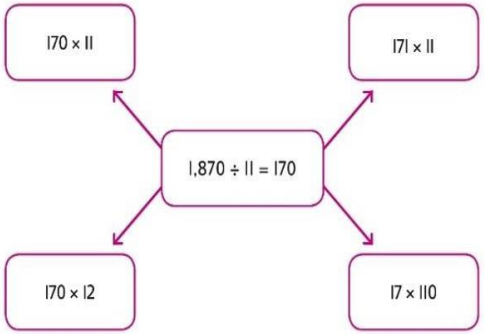
12 is not a square number, because you cannot multiply a whole number by itself to make 12.

Prime Numbers to 100

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

Composite Numbers

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

Using knowledge of factors and partitions to compare methods for multiplications	Use equipment to understand square numbers and cube numbers.   $5\times5=5^2=25$ $5\times5\times5=5^3=25\times5=125$	Compare methods visually using an area/grid model. Understand that multiple approaches will produce the same answer if completed accurately.  	Use a known fact to generate families of related facts.  Use factors to calculate efficiently. 15×16 $=3\times5\times2\times8$ $=3\times8\times2\times5$ $=24\times10$ $=240$

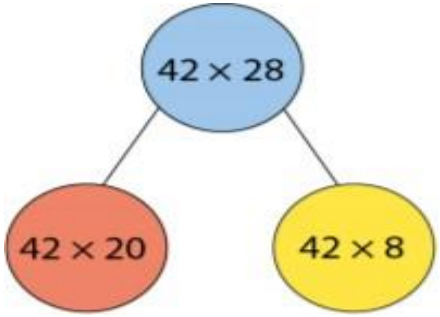
Year 6

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- perform mental calculations, including with mixed operations and large numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve problems involving multiplication

<table>
<tr>
<td>Multiplying up to 4-digits by a 2-digit number</td>
<td>This should be taught when short multiplication is secure.

Manipulatives can still be used but should not be necessary. Images can support process.

 
</td>
<td>Formal long multiplication ensuring that place value is secure at each stage.

Step 1
<table>
<tr><th></th><th>100s</th><th>10s</th><th>1s</th></tr>
<tr><td></td><td></td><td>3</td><td>1</td></tr>
<tr><td>×</td><td></td><td>2</td><td>4</td></tr>
<tr><td></td><td></td><td></td><td>4</td></tr>
</table>
Step 2
<table>
<tr><th></th><th>100s</th><th>10s</th><th>1s</th></tr>
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<tr><td>×</td><td></td><td>2</td><td>4</td></tr>
<tr><td></td><td>1</td><td>2</td><td>4</td></tr>
</table>
Step 3
<table>
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<tr><td></td><td></td><td>3</td><td>1</td></tr>
<tr><td>×</td><td></td><td>2</td><td>4</td></tr>
<tr><td></td><td>1</td><td>2</td><td>4</td></tr>
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</table>
Step 4
<table>
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<tr><td>×</td><td></td><td>2</td><td>4</td></tr>
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Step 5
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<tr><td>×</td><td></td><td>2</td><td>4</td></tr>
<tr><td></td><td>1</td><td>2</td><td>4</td></tr>
<tr><td></td><td>6</td><td>2</td><td>0</td></tr>
</table>
Step 6
<table>
<tr><th></th><th>100s</th><th>10s</th><th>1s</th><th></th></tr>
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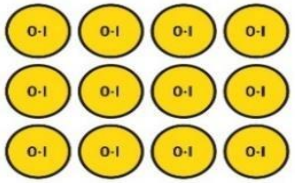
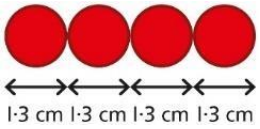
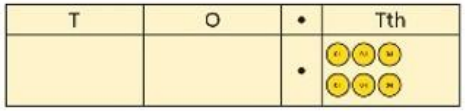
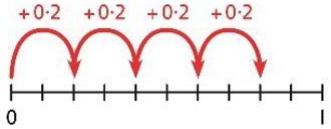
<tr><td>x</td><td></td><td>2</td><td>4</td><td></td></tr>
<tr><td></td><td>1</td><td>2</td><td>4</td><td>31 × 4</td></tr>
<tr><td></td><td>6</td><td>2</td><td>0</td><td>31 × 20</td></tr>
<tr><td></td><td>7</td><td>4</td><td>4</td><td></td></tr>
</table></td>
<td>Formal long multiplication method used with increasing confidence.

<table>
<tr><th></th><th>100s</th><th>10s</th><th>1s</th></tr>
<tr><td></td><td></td><td>2</td><td>7</td></tr>
<tr><td>×</td><td></td><td>2</td><td>3</td></tr>
<tr><td></td><td></td><td>8</td><td>1</td></tr>
<tr><td></td><td>5</td><td>4</td><td>0</td></tr>
<tr><td></td><td>6</td><td>2</td><td>1</td></tr>
</table>

<table>
<tr><th></th><th>1,000s</th><th>100s</th><th>10s</th><th>1s</th></tr>
<tr><td></td><td></td><td>3</td><td>1</td><td>2</td></tr>
<tr><td>×</td><td></td><td></td><td>2</td><td>8</td></tr>
<tr><td></td><td>2</td><td>4</td><td>9</td><td>6</td></tr>
<tr><td></td><td>6</td><td>2</td><td>4</td><td>0</td></tr>
<tr><td></td><td>8</td><td>7</td><td>3</td><td>6</td></tr>
</table></td>
</tr>
</table>

Multiply 4dgt X 2dgt	2 1 3 1 1 2 X 6549 43 19647 261960 281607

Multiplying decimals	Explore decimal multiplications using place value equipment and in the context of measures.  3 groups of 4 tenths 4 groups of 3 tenths =12 tenths  1·3 cm 1·3 cm 1·3 cm 1·3 cm 4×1cm=4 cm 4×0·3 cm=1.2 cm 4×1·3=4+1·2=5·2 cm	Understand the link between repeated addition and multiplication   Use known facts to multiply decimals. 4×3=12 4×0·3=1·2 4×0·03=0·12 20×5=100 20×0·5=10 20×0·05=1	Use partitioning or column method to multiply decimals. 3.19 X 8 25.52 1 7

Multiply 1dgt (up to two decimal places) X whole number Use this method to solve problems involving various units of measure (e.g. money, capacity etc.)