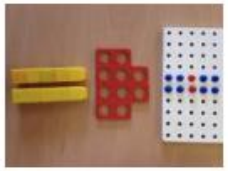
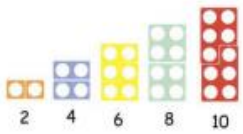
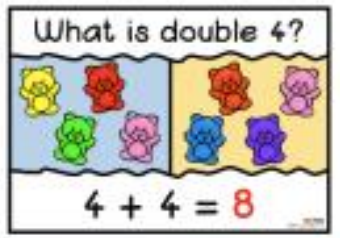
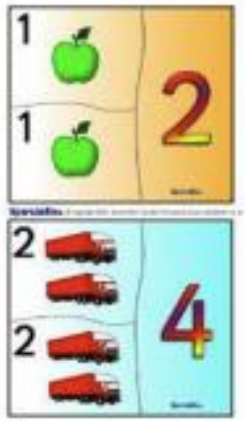
South Gosforth First School

'Roots to grow and wings to fly'

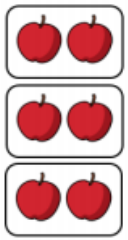
Calculation Progression

Multiplication

EYFS

Early Learning Goals	Models and Representations - CPA
Numerical patterns ELG Explore and represent patterns within numbers up to 10, including evens and odds, **double facts and how quantities can be distributed equally.**	   Counting and other maths resources for children to make 2 equal groups.   Physical and real life examples that encourage children to see concept of doubling as adding two equal groups.    Pictures and icons that encourage children to see concept of doubling as adding two equal groups.

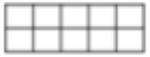
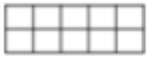
Year 1

Objective and Strategy	Models and Representations - CPA
Add equal groups Children use equal groups to find a total. They focus on counting equal groups of 2, 5, and 10 and explore this within 50. Stem sentences are used to support, linking the calculation with the situation. This step is developed in Year 2, as repeated addition is explored alongside the multiplication symbol.	How many wheels altogether?  2 + 2 + 2 + 2 + 2 = How many fingers altogether?  5 + 5 + 5 =
Make arrays Children begin to make arrays by making equal groups and building them up in columns or rows. They use a range of concrete and pictorial representations alongside sentence stems to support their understanding.	There are ____ apples in each row. There are ____ rows. ____ + ____ + ____ = ____ There are ____ apples altogether. 

Make doubles

Children explore doubling with number up to 20. Double is explained as two groups of a number or an amount.

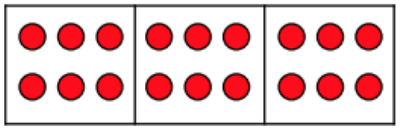
This supports multiplying by 2 (linked to doubling) in Year 2.

Build	Represent	Add	Double
		1 + 1 = 2	Double 1 is 2
		2 + 2 = __	Double 2 is __
		3 + 3 = __	Double 3 is __
		__ + __ = __	Double 4 is __

Further Notes

- Children will experience regular counting on and back from different numbers in 1s and in multiples of 2, 5 and 10.
- Children will see ways to represent odd and even numbers which will help them to understand the pattern in numbers.
- Children will begin to understand multiplication as scaling eg that tower of cubes is double the height of the other tower.

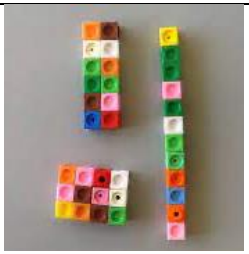
Year 2

Objective and Strategy	Models and Representations - CPA
The Multiplication Symbol Children are introduced to the multiplication symbol for the first time. They should link repeated addition and multiplication together, using stem sentences to support their understanding. They should also be able to interpret mathematical stories and create their own involving multiplication.	 ___ + ___ + ___ = 18 ___ × ___ = 18 There are ___ equal groups with ___ in each group. There are three ___. 2+2+2+2+2 = _____ 2+2+2 = _____ 10+10+10 = _____
Multiplication from pictures Children will use the multiplication symbol and work out the total from pictures, initially by skip counting. They should also be able to interpret a multiplication word problem by drawing images to help them solve it.	 ___ × ___ = ___ ___ lots of 3 = ___ ___ multiplied by ___ = 12 Complete the table. Picture / Multiplication / Sentence 4 × 10 = 40 / 4 lots of 10 is equal to 40 35 = 7 × 5 6 lots of 3 is equal to 18

Using arrays

Children explore arrays to see the commutativity of multiplication facts e.g. 5 × 2 = 2 × 5 The use of the array could be used to help children calculate multiplication statements.

With 12 cubes, how many different arrays can you create?



Complete the number sentences to describe the arrays.

2 × 3 and ___ × ___

___ × ___ and ___ × ___

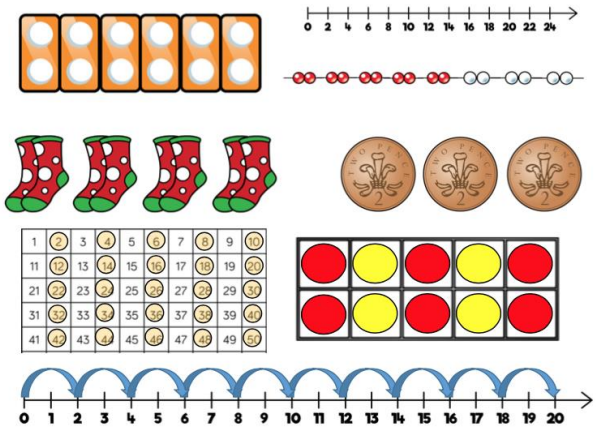
Draw an array to show:

4 × 5 = 5 × 4

3 lots of 10 = 10 lots of 3

Multiplying by 2

Children should be comfortable with the concept of multiplication so they can apply this to multiplication tables. Images, as well as number tracks, should be used to encourage children to count in twos.

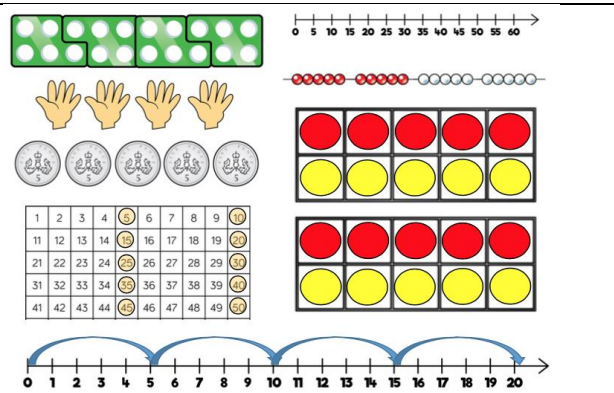
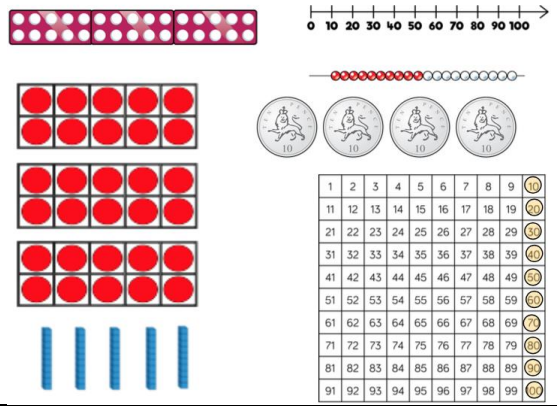


Fill in the blanks.

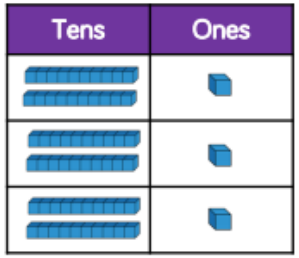
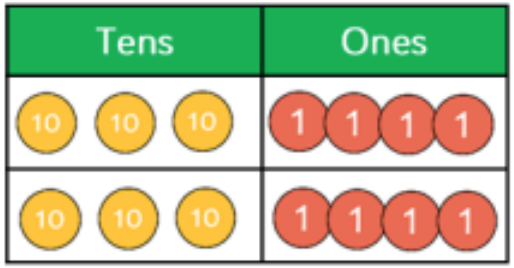
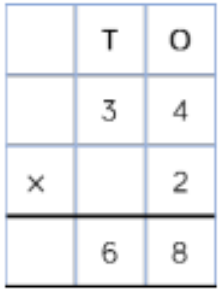
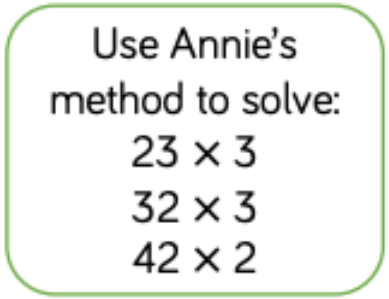
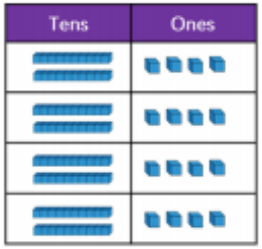
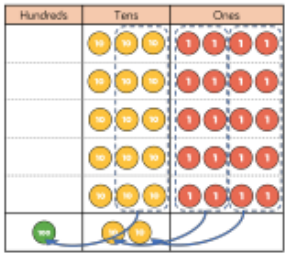
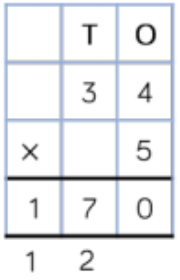
3 × ___ = 6

___ × 2 = 20

___ = 8 × 2

Multiplying by 5 Children can already count in 5s from any given number. They will also have developed understanding of the 2 times table. This small step is focused on the 5 times table and it is important to include the use of zero. Children should see the = sign at both ends of the calculation to understand that it means 'equals to'.	 $\_\_\_ \times 5 = 35$
Multiplying by 10 (The 10 times table) Children have counted in 10s from any given whole number. This small step is focused on the 10 times-table and it is important to include the use of zero. Children should see the = sign at both ends of the calculation to understand what it means.	 $\_\_ \times 10 = 30$
Further Notes	• Children will count regularly, on and back, in steps of 2, 3, 5 and 10. • Children will be encouraged to see the inverse relationship between multiplication and division. • Children will begin to understand multiplication as scaling (eg multiplying by 3 is 3 times bigger/taller). • Children will link multiplying by 2 to the doubling learned in Year 1.

Year 3

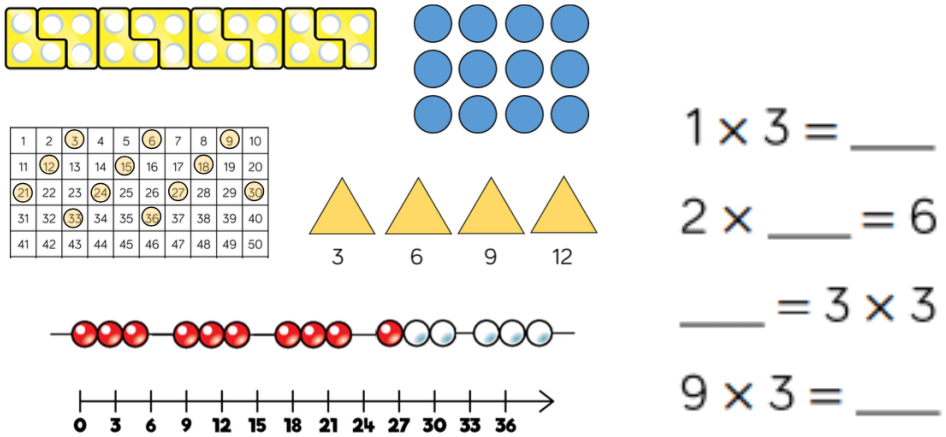
Objective and Strategy	Models and Representations - CPA
Multiplying 2-digits by 1-digit (1) Children use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives. They use the formal method of column multiplication alongside the concrete representation. They also apply their understanding of partitioning to represent and solve calculations. In this step, children explore multiplication with no exchange.	   
Multiplying 2-digits by 1-digit (2) Children continue to use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives. They move on to explore multiplication with exchange. Each question in this step builds in difficulty.	   

Multiplying by 3

Children draw on their knowledge of counting in threes in order to start to multiply by 3.

They use their knowledge of equal groups to use concrete and pictorial methods to solve questions and problems involving multiplying by 3.

As fluency in the 3 times table increases, children apply their knowledge to different contexts.



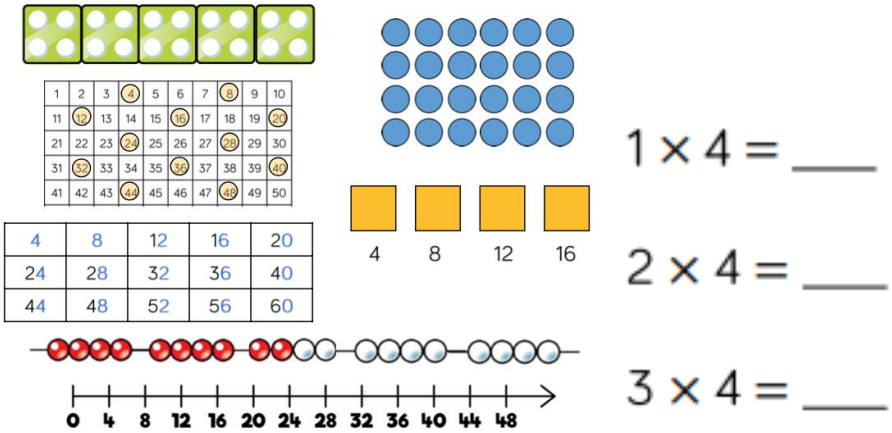
Multiplying by 4

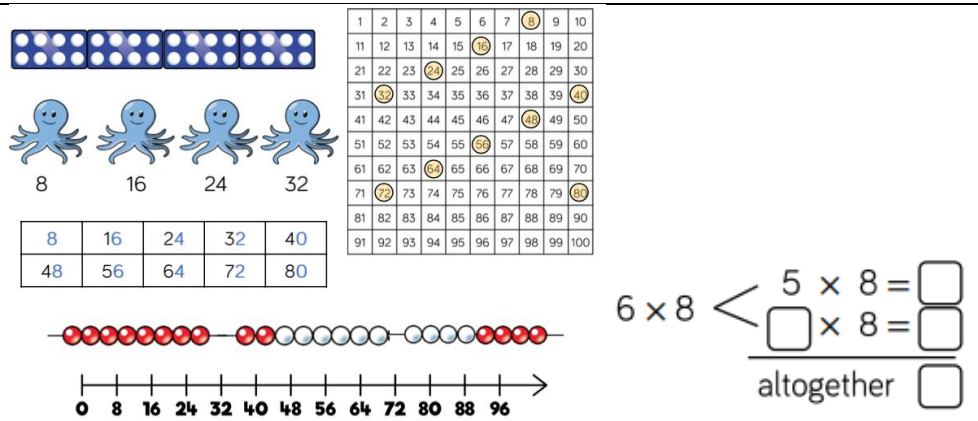
Building on their knowledge of the two times table, children multiply by 4.

They link multiplying by 4 to doubling then doubling again.

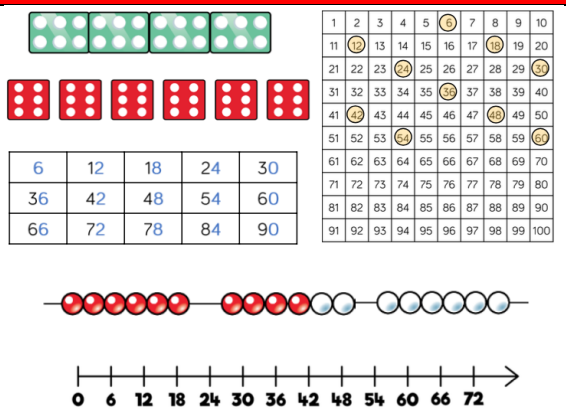
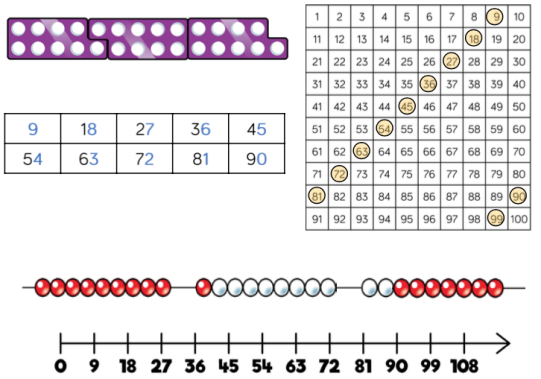
Children connect multiplying by 4 to repeated addition and counting in 4s.

Children will use knowledge of known multiplication tables (2, 3, 5 and 10 times tables) and an understanding of commutativity to develop knowledge of the 4 times table eg 4 x3 = 12 so 3 x 4=12



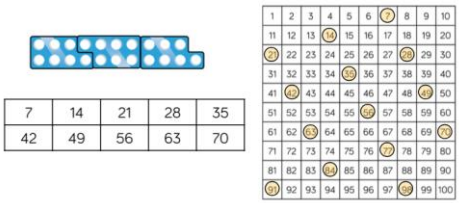
Multiplying by 8 Building on their knowledge of the 4 times table, children start to multiply by 8, understanding that each multiple of 8 is double its equivalent multiple of 4. Children explore the concept of multiplying by 8 in different ways, where 8 is the first and second number in the calculation.	
Further Notes	• Children will continue to count regularly, and back, now including multiples of 4, 8, 50 and 100 and steps of 1/10.. • Children will learn that the factors can be written in either order and that the product remains the same eg 3 x 4 = 12 and 4 x 3 = 12. • When comparing multiplcation tables, children will be encouraged to use known facts eg if 4 x 3 = 12, then 4 x 30 = 120. • Children will be encouraged to see the link between the multiplication and division facts as they learn each multiplication table.

Year 4

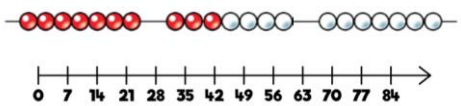
Objective and Strategy	Models and Representations - CPA
Multiply by 6 Children use concrete and pictorial methods to solve multiplication problems. They will develop their fluency by applying knowledge of the 3 times table and that each multiple of 6 is double the equivalent multiple of 3. They can apply this to multiplying by 10 or 100 (for example knowing that 30 x 6 = 180 because they know that 3 x 6 =18).	 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 0 6 12 18 24 30 36 42 48 54 60 66 72 $6 \times 2 = \_\_\_$ $\_\_\_ \times 20 = 120$ $6 \times \_\_\_ = 1{,}200$
Multiply by 9 Children use concrete and pictorial methods to solve multiplication problems. They will develop their fluency by applying their knowledge that each multiple of 9 is one less than the equivalent multiple of 10 and using that knowledge to derive related facts. Children will be encouraged to apply their knowledge of the 9 times table when multiplying by 10 and 100.	 9 18 27 36 45 54 63 72 81 90 0 9 18 27 36 45 54 63 72 81 90 99 108 $1 \times 9 = \_\_\_$ $\_\_\_ \times 9 = 90$ $9 \times \_\_\_ = 900$

Multiply by 7

Children count in 7s, using their knowledge of equal groups supported by the use of concrete and pictorial methods to solve multiplication calculations and problems.



7	14	21	28	35
42	49	56	63	70



Use your knowledge of the 7 times table to calculate.

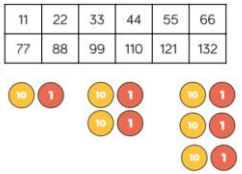
80 × 7 = ___ ___ = 60 × 7

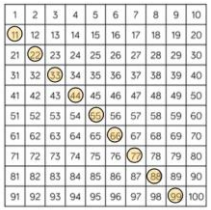
70 × 7 = ___ 7 × 500 = ___

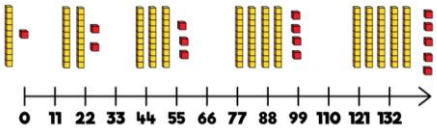
Multiply by 11 and 12

Building on their knowledge of the 1, 2 and 10 times-tables, children explore the 11 and 12 times-tables through partitioning.

11	22	33	44	55	66
77	88	99	110	121	132







2 × 10 = ___ 2 × 1 = ___

2 lots of 10 doughnuts = ___ 2 lots of 1 doughnut = ___

2 lots of 11 doughnuts = ___

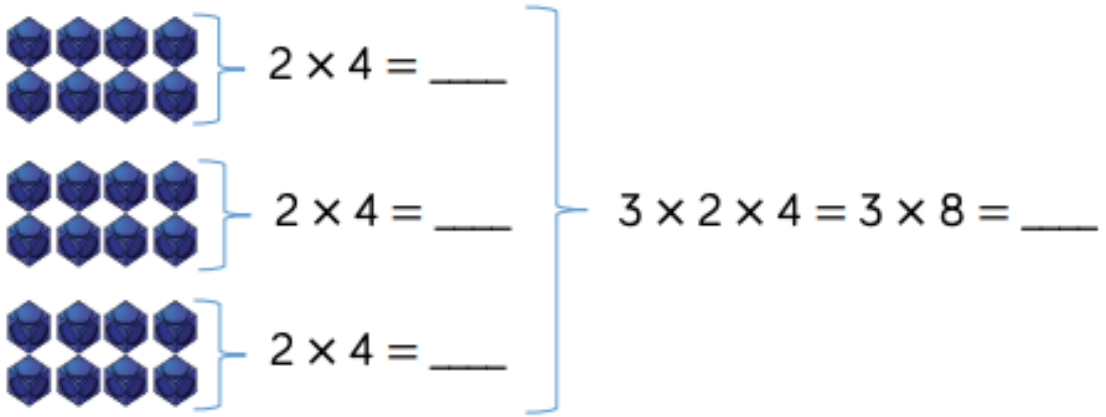
2 × 10 + 2 × 1 = 2 × 11 = ___

Multiply 3 Numbers

Children are introduced to the 'Associative Law' to multiply 3 numbers. This law focuses on the idea that it doesn't matter how we group numbers when we multiply.
e.g. 4 x 5 x 2 = (4 x 5) x 2 = 20 x 2 = 40

or 4 x 5 x 2 = 4 x (5 x 2) = 4 x 10 = 40

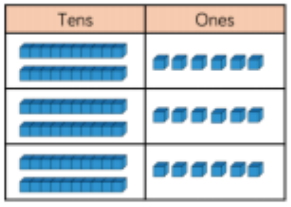
They link this idea to commutativity and see that we can change the order of the numbers to group them more efficiently. e.g. 4 x 2 x 5 = (4 x 2) x 5 = 8 x 5 = 40

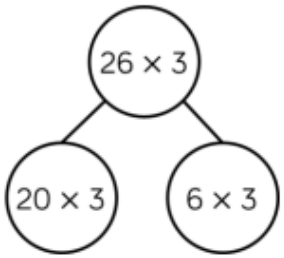


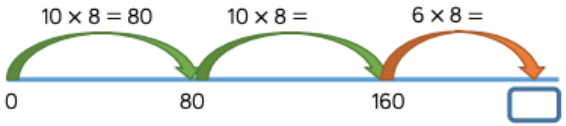
Multiply two digits by 1 digit (1)

Children use a variety of informal written methods to multiply a two-digit and one-digit number.

Children will explore when it would be more efficient to use a mental method to multiply and when they would represent their thinking by showing their working.



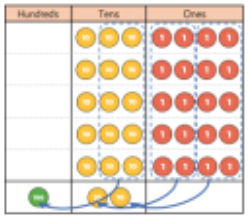




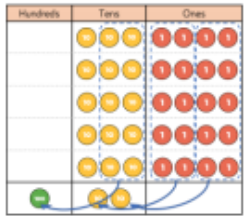
26 x 8 =

Multiply 2-digits by 1-digit (2)

Children build on their understanding of formal multiplication from Year 3 to move to the formal short multiplication method.
Children use their knowledge of exchanging ten ones for one ten in addition and apply this to multiplication, including exchanging multiple groups of tens. They use place value counters to support understanding.



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

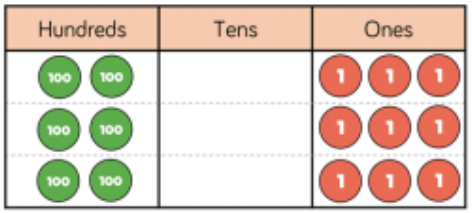


	H	T	O		
		3	4		
×			5		
	1	7	0		
	1	2			

	T	O
	4	3
×		3

Multiply 3-digits by 1-digit

Children build on previous steps to represent a three-digit number multiplied by a one-digit number with concrete manipulatives. Children continue to exchange groups of ten ones for tens and record this in a written method.



	H	T	O
	2	0	3
×			3

Further Notes	• Children should count regularly, on and back, now including multiples of 6, 7, 9, 25 and 1000 and steps of 1/100. • Children develop their mental multiplication by exploring different ways to calculate. They partition two-digit numbers into tens and ones or into factor pairs in order to multiply one and two-digit numbers. • The use if the Gattengo chart and the place-value chart will help children to see that multiplying by 100 is equivalent to multiplying by 10 and then multiplying by 10 again. • They continue to practise recalling muplication facts up to 12 x 12 and this fluency will support formal written multiplication. • Children will continue to develop their understanding of the commutative property of multiplication and how this links to division. • Children will apply their understanding of the distributive property of multiplication by helping them to solve problems beyond the multiplication tables they have learnt such as if they are given 20 x 6 = 120, 21 x 6 = ?. (Knowing that adjacent multiplications in the 6 times table have a difference of 6 and adding that additional 6)