Multiplication

For each of the following progressive stages of multiplication calculation it is recommended to use concrete, pictorial and abstract to aid understanding.

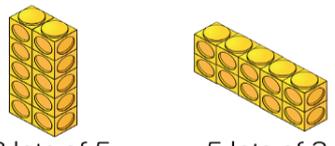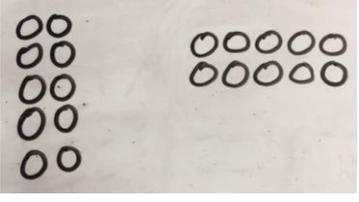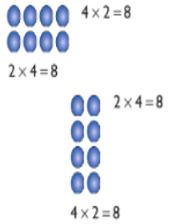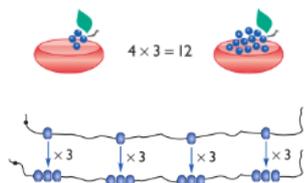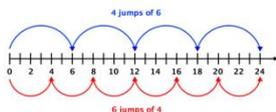|		Vocabulary
Reception pupils should be taught to: • . solve problems, including doubling, halving and sharing.		double two lots of
Children will take part in lots of practical activities, and an adult will record their verbal explanations of their use of numbers.		While splitting the toy animals between two groups, Jake put them into 4 equal groups of two. "I've got four lots of two."
Year One pupils should be taught to: • count on in steps of 2s, 5s and 10s. • solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher		**New vocabulary** steps of... lots of, groups of times repeated addition / groups equal groups of
Repeated grouping / repeated addition. 3 x 4 is 4 + 4 + 4 There are 3 equal groups, with 4 in each. 	Children to represent practical resources in a picture and use a bar model. 	3 x 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups. 3 x 4 Base 10 equipment could be used.		**The abstract number line:** Showing three jumps of four. 3 x 4 = 12
Use arrays to illustrate commutativity, counters and other objects can also be used. 2 lots of 5 5 lots of 2	Use pictorial arrays to represent multiplication and to show the commutative law. 5 lots of 2 and 2 lots of 5 	Start to represent using calculations alongside practical and pictorial representations. 2 + 2 + 2 + 2 = 8 2 multiplied by 4 is 8 8 = 2 x 4 8 = 4 + 4
Year Two pupils should be taught to: • count in steps of 2, 3, and 5 from 0, and in 10s from any number, forward and backward • recall and use multiplication and division 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 • show that multiplication of 2 numbers can be done in any order (commutative) • solve problems involving multiplication, using materials, arrays,		**New Vocabulary** X, times, multiply, multiplied by multiple of once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition array row, column double, halve
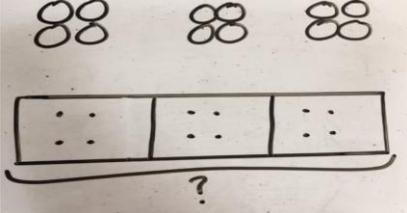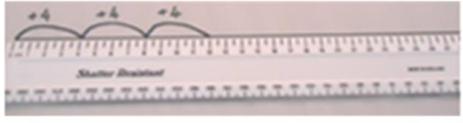
repeated addition, mental methods, and multiplication and division facts, including problems in contexts	

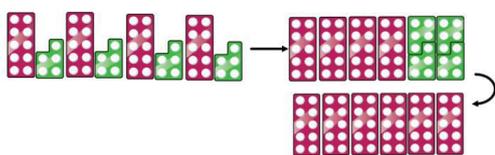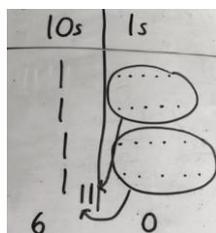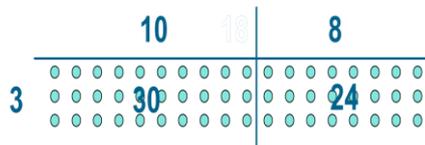|		
Continue to use concrete objects, arrays and repeated addition, using numbers in the 2, 3, 5 and 10 times $4 \times 3 = 12$	Develop understanding of multiplication using number lines and recognise odd and even numbers.	Express as a number sentence using X, then use understanding of the inverse to solve missing box questions. ☐ X 2 = 14 14 = 2 X ☐ X ⊙ = 14 14 = ☐
Partition to multiply using numicon, base 10 or cuisenaire rods. 4 x 15	Children to represent the concrete manipulatives pictorially.	Children to be encouraged to show the steps they have taken. A number line can also be used. 4 x 15 ↙↘ 10 5 $10 \times 4 = 40$ $5 \times 4 = 20$ $40 + 20 = 60$
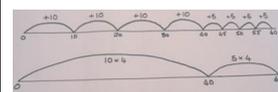
Year Three pupils should be taught to:
- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division 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 and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

New Vocabulary
multiplication
multiplied by
multiple of
product
grid   partition

Children to progress onto a written method to multiply 2 dgit by 1 digit, using understanding of visual representations.	Develop onto the grid method.	Children should also record what it is they are doing to show understanding. 3 X 18 3 X 10 = 30 ↙↘ 3 X 8 = 24 10 8 30 +24 = 54

Develop onto the grid method.

X	10	8
3	30	24

30 + 24 = 54

Year Four pupils should be taught to:
- count in multiples of 6, 7, 9, 25 and 1,000
- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
- recognise and use factor pairs and commutativity in mental calculations

New Vocabulary
inverse
expanded method
formal short method
carry

• multiply two-digit and three-digit numbers by a one-digit number using formal written layout • solve problems involving multiplying and adding		
Children to embed and deepen their understanding of the grid method to multiply 3 digit numbers by a 1 digit. 	X	300	60	9
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4	1200	240	36 |
			
			``
			   1200
			+ 240
			+ 36
			   1476
			``
				Use the **expanded method** to help step to the formal method, by developing the understanding of the grid to a vertical form.
				
				``
				  69
				X 4
				  36 (4 X 9)
				 240 (4 X 60)
				 276
				``
					Formal short multiplication method to multiply two digit and three digit numbers by a one digit number.
					
					``
					  69 369
					X 4 X 4
					 276 1476
					   3 2 3
					``

Year Five pupils should be taught to: • identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers • 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 and divide numbers mentally, drawing upon known facts • multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000 • solve problems involving multiplication and division		**New vocabulary** multiples factors factor pairs formal long method
Children to explore how the grid method supports an understanding of long multiplication for 2 digit by 2 digit. 25 X 36 = | X	20	8
30	600	240

6	120	48	
			
			``
			   840
			+ 168
			 1008
			   1
			``
				Formal long multiplication method to multiply two digit and three digit numbers by a two digit number.
				
				``
				   4 1 4
				  28 728
				  2 2
				X 36 X 36
				 168 4368
				 840 21840
				1008 26208
				  1 1 1
				``
					Extend to multiplying numbers up to 4 digits.
					
					(See year 6)

Year Six 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 • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out calculations involving the 4 operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy		**New vocabulary** common multiple highest common multiple common factor lowest common factor composite number

Written methods
As year 5, progressing to larger numbers.
``
  4 1 4
  3728
   2 2
 X 36
 22368
1 1 1 840
134 208
   1 1 1
``
	Continue with decimal calculations with one decimal place. Line up the decimal point.
	
	``
	  36.2
	X 4
	 144.8
	   2
	``
		Problem Solving
		Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.