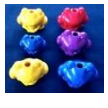
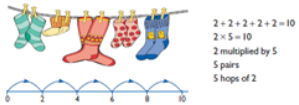
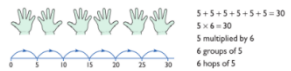
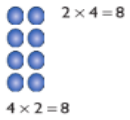
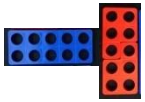
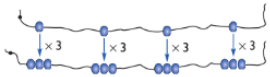
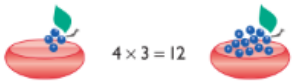
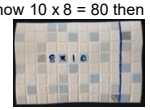
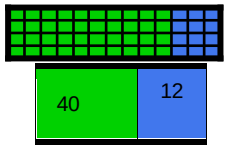
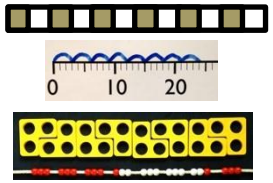
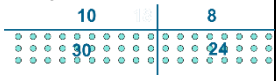
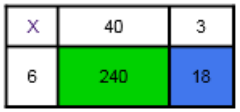
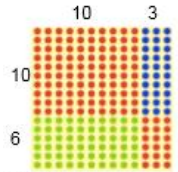
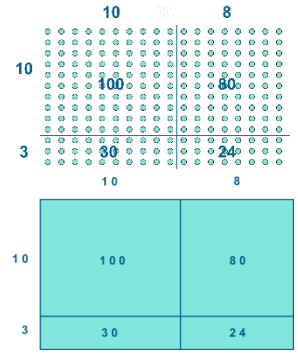
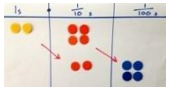
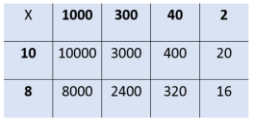
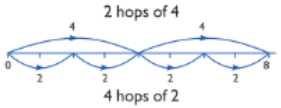
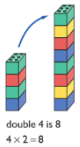
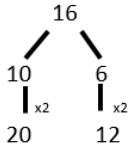
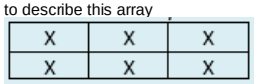
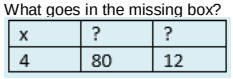
Multiplication

Year	1	2	3	4	5	6
Written Methods: Developing conceptual understanding	2 frogs on each lily pad.       Understand multiplication is related to doubling and combing groups of the same size (repeated addition) Washing line, and other practical resources for counting. Concrete objects. Numicon; bundles of straws, bead strings   Problem solving with concrete objects (including money and measures Use Cuisenaire and bar method to develop the vocabulary relating to 'times' : pick up five, 4 times Use arrays to understand multiplication can be done in any order (commutative)  	Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs 5 frogs on each lily pad 5 x 3 = 15   5 x 2 = 2 5  Build tables on counting stick  Link to repeated addition  Expressing multiplication as a number sentence using x Using understanding of the inverse and practical resources to solve missing number problems. 7 x 2 = □ □ = 2 x 7 7 x □ = 14 14 = □ x 7 □ x 2 = 14 14 = 2 x □ □ x O= 14 14 = □ x O Develop understanding of multiplication using array and number lines (see Year 1). Include multiplications not in the 2, 5 or 10 times tables. Begin to develop understanding of multiplication as scaling (3 times bigger/taller)    Doubling numbers up to 10 + 10	Use practical and informal written methods to multiply and divide two-digit numbers (e.g. 13 × 3, 50 ÷ 4) using known multiplication tables; round remainders up or down, depending on the context. If I know 10 x 8 = 80 then …  So 13 x 4 = 10 x 4 + 3 x 4  Cuisenaire is a useful resource for creating arrays. Build tables on counting stick  Start moving towards using written methods based on understanding of visual images  Give children opportunities to explore this and deepen understanding using Dienes, Cuisenaire and place value counters. The number line should continue to be used as an important image to support thinking, and the use of informal jottings and drawings to solve problems should be encouraged. Demonstrating multiplication on a number line – jumping in larger groups of amounts 13 x 4 = 10 groups 4 = 3 groups of 4	Multiply and divide two-digit and three-digit numbers by a one-digit number using informal written methods with increasing efficiency, including division with remainders. 43 x 6 by partitioning   40 x 6 = 240 3 x 6 = 18 43 x 6 = 258 If I know 4 x 6 = 24 then 40 x 6 is ten times bigger, 40 x 60 is one hundred times bigger. 13 x 16 by partitioning  100 + 30 + 60 + 18 = 208 Build tables on counting stick  Children to embed and deepen their understanding of the grid method to multiply up 3-digit x 2-digit. Ensure this is still linked back to their understanding of arrays and place value counters.  The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged.	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. 243 x 36 1458 7290 8748 1 Grid method linked to formal written method. What's the same? What's different? Where does this number appear in both methods?  Place value counters can be used to support long multiplication. If I know 4 x 6 then 0.4 x 6 is ten times smaller 0.4 x 0.6 is ten times smaller again.  The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged.	Multiply one-digit numbers with up to two decimal places by whole numbers Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. 5172 x 38 41376 + 155160 196536 1 Continue to make connections between the grid method and long multiplication.  2 3 1 1342 x 18 13420 10736 24156 1

X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

Year	1	2	3	4	5	6
		Link with understanding scaling Using known doubles to work out double 2-digit numbers (double 15 = double 10 + double 5)  Towards written methods Use jottings to develop an understanding of doubling two digit numbers. 					
Supporting mental strategies: with jottings or in your head	**Counting**. Children should experience regular counting on and back from different numbers in 1s and in multiples of 2, 5 and 10. Children should memorise and reason with numbers in 2, 5 and 10 times tables They should see ways to represent odd and even numbers. This will help them to understand the pattern in numbers.  Children should begin to understand multiplication as scaling in terms of double and half. (e.g. that tower of cubes is double the height of the other tower) Give practical contexts: • If one teddy has two apples, how many apples will three teddies have? • If we put two pencils in each pencil pot how many pencils will we need?	**Counting** Children should count regularly, on and back, in steps of 2, 3, 5 and 10. **Missing numbers** 10 = 5 x □ What number could be written in the box? Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20 Number lines should continue to be an important image to support thinking, for example Use a clock face to support understanding of counting in 5s. Use money to support counting in 2s, 5s, 10s, 20s, 50s **Making links** Write the multiplication number sentences to describe this array  What do you notice? Write the division sentences. **Prove It** Which four number sentences link these numbers? 3, 5, 15? Prove it. **Use the inverse** Use the inverse to check if the following calculations are correct: 12 ÷ 3 = 4 3 x 5 = 14	**Counting** Children should continue to count regularly, on and back, now including multiples of 4, 8, 50, and 100, and steps of 1/10. **Missing number problems**: 24 = □ x □ Which pairs of numbers could be written in the boxes? □□ × □ Using the digits 2, 3 and 4 in the calculation above how close can you get to 100? What is the largest product? What is the smallest product? Multiply one- and two-digit numbers by 10 or 100, and describe the effect. Use doubling and halving to support mental calculations. Doubling 2 digit numbers using partitioning. **Use a fact** 20 x 3 = 60. Use this fact to work out 21 x 3 = 22 x 3 = 23 x 3 = 24 x 3 = **Making links** 4 × 6 = 24 How does this fact help you to solve these calculations? 40 x 6 = 20 x 6 = 24 x 6 = How are the 2, 4 and 8 times tables related? **Prove It** What goes in the missing box?  Prove it.	**Counting** Counting in multiples of 6, 7, 9, 25 and 1000, and steps of 1/100. **Missing number/digit problems:** e.g. □2 x 5 = 160 72 = □ x □ 6□ x 4 = 512 Which pairs of numbers could be written in the boxes? Use place value, known and derived facts, including doubling and halving, to multiply and mentally, including multiplying by 0 and 1; multiplying together three numbers. Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths. Recognise and use factor pairs and commutativity in mental calculations - e.g. use factor pairs to solve this calculation? 13 x 12 = (13 x 3 x 4, 13 x 3 x 2 x 2, 13 x 2 x 6) **Mental methods** Solving practical problems where children need to scale up. Relate to known number facts. (e.g. how tall would a 25cm sunflower be if it grew 6 times taller?) Use the context of a week and a calendar to support the 7 times table (e.g. how many days in 5 weeks?) Use of finger strategy for 9 times table. They should be encouraged to choose from a range of strategies: * Partitioning using x10, x20 etc * Doubling to solve x2, x4, x8 * Recall of times tables * Use of commutativity of multiplication **Use a fact** 63 ÷ 9 = 7 Use this fact to work out 126 ÷ 9 = 252 ÷ 7 =	**Counting** Children should continue to count regularly, on and back, now including steps of powers of 10. **Missing number/digit problems:** e.g. 6 x 0.9 = □x 0.03 6 x 0.04 = 0.008 x □ 12□2 ÷ 6 = 212 14□4 ÷ 7 = 212 22□3 ÷ 7 = 321 r 6 Which numbers could be written in the boxes? **Mental methods** X by 10, 100, 1000, including decimals Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Use practical resources and jottings to explore equivalent statements (e.g. 4 x 35 = 2 x 2 x 35) Solving practical problems where children need to scale up. Relate to known number facts. They should be encouraged to choose from a range of strategies to solve problems mentally: * Partitioning using x10, x20 etc * Doubling to solve x2, x4, x8 * Use of commutativity of multiplication e.g. 5 x 17 x 2 = 5 x 2 x 17 If children know the times table facts to 12 x 12. Can they use this to recite/derive other times tables (e.g. the 13 times tables or the 24 times table) **Making links** 7 x 8 = 56. How can you use this fact to solve these calculations? 0.7 x 0.8 = 5.6 ÷ 8 = **Size of an answer** The product of a two digit and three-digit number is approximately 6500. What could the numbers be?	**Counting** Children should continue to count regularly, on and back, building on previous years' skills. **Missing number/digit problems: e.g.** What goes in the missing box? 18□4 ÷ 12 = 157 38□5 ÷ 18 = 212.5 33□2 ÷ 8 = 421.5 Identify common factors, common multiples and prime factors Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. **Mental methods** Children should experiment with order of operations, investigating the effect of positioning the brackets in different places, e.g. 20 – 5 x 3 = 5; (20 – 5) x 3 = 45 They should be encouraged to choose from a range of strategies to solve problems mentally: * Partitioning using x10, x20 etc * Doubling to solve x2, x4, x8 * Use of commutativity of multiplication e.g. 5 x 17 x 2 = 5 x 2 x 17 If children know the times table facts to 12 x 12. Can they use this to recite other times tables (e.g. the 13 times table or the 24 times table) Explore order of operations: brackets first, then division and multiplication (left to right) before addition and subtraction (left to right). Children could learn a mnemonic such as BODMAS, or could be encouraged to design their own ways of remembering.

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Just know it!	Count in multiples of 2s, 5s and 10s.	Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers. **Achieve bronze and silver for 2x, 5x and 10x tables**	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables. **Achieve golds for 10, 2, 5, 4, 8 and 3 times tables and bronzes for 6, 7, 9, 11 and 12.**	Recall multiplication and division facts for multiplication tables up to 12 × 12 **Complete times table number card.**	Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) **Maintain fluency in times tables and move onto the mental methods number cards.**	Recall prime numbers up to 19. **Maintain fluency in times tables and complete mental methods number cards.**
Vocabulary	Ones, groups, lots of, doubling repeated addition groups of, lots of, times, columns, rows longer, bigger, higher etc times as (big, long, wide …etc)	multiple, multiplication array, multiplication tables / facts groups of, lots of, times, columns, rows	partition grid method inverse product	factor	cube numbers square numbers common factors	prime numbers, composite numbers
Reasoning	Understand 6 counters can be arranged as 3+3 or 2+2+2 or 1+1+1+1+1+1 to represent multiplication. Understand that when counting in twos, the numbers are always even.	• Prove that multiplication is commutative (array is useful representation for this) • True or false? When you count up in tens starting at 5 there will always be 5 units.	True or false? • All the numbers in the two times table are even. • There are no numbers in the three times table that are also in the two times table. Size of an answer: Will the answer to the following calculations be greater or less than 80. Prove it. 23 x 3= 32 x 3 = 42 x 3 = 36 x 2=	• When they know multiplication facts up to x12, do they know what x13 is? (i.e. can they use 4x12 to work out 4x13 and 4x14 and beyond?) • Is it always, sometimes or never true that an even number that is divisible by 3 is also divisible by 6. • Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.	• Understanding that the use of scaling by multiples of 10 can be used to convert between units of measure (e.g. metres to kilometres means to times by 1000) • Is it always, sometimes or never true that multiplying a number always makes it bigger • Is it always, sometimes or never true that prime numbers are odd. • Is it always, sometimes or never true that when you multiply a whole number by 9, the sum of its digits is also a multiple of 9 • Is it always, sometimes or never true that a square number has an even number of factors.	• Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big. • Is it always, sometimes or never true that when you square an even number, the result is divisible by 4 • Is it always, sometimes or never true that multiples of 7 are 1 more or 1 less than prime numbers. • Which of these number sentences is correct? 3 + 6 x 2 =15 6 x 5 – 7 x 4 = 92 8 x 20 ÷ 4 x 3 = 37
Questions	Why is an even number an even number? What do you notice? What's the same? What's different? Can you convince me? How do you know?	What do you notice? What's the same? What's different? Can you convince me? How do you know?	What do you notice? What's the same? What's different? Can you convince me? How do you know?	What do you notice? What's the same? What's different? Can you convince me? How do you know?	What do you notice? What's the same? What's different? Can you convince me? How do you know?	What do you notice? What's the same? What's different? Can you convince me? How do you know?
Half-termly focus for starters	Count in 2s.	10x table	Review 2,5 and 10 times tables.	Review the 4x and 8x tables and understand 10 times bigger.	Review the 4x and 8x tables; understand 100 and 1000 times bigger.	Multiplication facts up to 12 x 12
	Count in 10s.	5x table	4x table	Review 3x table, and move onto 6x and 12x tables	Review 3x, 6x and 12x tables; understand 10,100 and 1000 times smaller.	Partition to multiply mentally
	Know doubles up to 10	Doubles up to 20 and multiples of 5	Double any 2-digit number	Double larger numbers and decimals	Double larger numbers and decimals	Double larger numbers and decimals.
	Count in 5s.	2x table	8x table	3x and 9x tables	3x and 9x tables	Multiplication facts up to 12 x 12
	Double multiples of 10	Count in 3s	3x table	11x and 7x tables	11x and 7x tables; partition to multiply mentally.	Partition to multiply mentally
	Count in 2s, 5s and 10s.	2x, 5x and 10x tables	6x table or review other tables	6x and 12x tables	6x and 12x tables	Double larger numbers and decimals.