John Fletcher of Madeley Primary School

Multiplication KS2

KS1	Pupils should memorise and reason with numbers in 2, 5 and 10 times tables. They should see ways to represent odd and even numbers and know how they are represented in tables. This will help them to understand the pattern in numbers. Pupils 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). Commutative law shown on array. Repeated addition can be shown mentally on a number line. Inverse relationship between multiplication and division. Use an array to explore how numbers can be organised into groups.	
Year	3	4
Layers of vocabulary  **Appendix 1a** Beck's Tiers of Vocabulary **Appendix 1b:** Vocabulary book	**Basic to subject specific (Beck's Tiers):** lots of, groups of ×, times, multiply, multiplication, multiplied by multiple of, product once, twice, three times… ten times… times as (big, long, wide… and so on) repeated addition array row, column double, halve share, share equally one each, two each, three each… **Instructional vocabulary:** carry on, continue repeat what comes next? predict describe the pattern, describe the rule find, find all, find different, investigate choose, decide, collect	**Basic to subject specific (Beck's Tiers):** lots of, groups of times, multiply, multiplication, multiplied by multiple of, product once, twice, three times… ten times… times as (big, long, wide… and so on) repeated addition array row, column double, halve, factor, multiple **Instructional vocabulary:** carry on, continue, repeat what comes next? predict describe the pattern, describe the rule pattern, puzzle, calculate, calculation, mental calculation, method, jotting, answer right, correct, wrong what could we try next? how did you work it out? number sentence sign, operation, symbol, equation
NC 2014	Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including 2 digit numbers times 1 digit numbers progressing to formal written methods.	Multiply 2 digit and 3 digit numbers by a 1 digit number using formal written layout. Solve problems involving multiplying and adding.

Multiplication KS2

<table>
<tr>
<td>Developing Conceptual/ Procedural Understanding</td>
<td>

Building tables

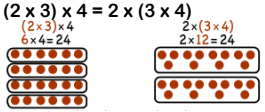
For example, build tables using counting stick- forwards and backwards and with missing jumps

MULTIPLICATION BOARD ITP

MULTIPLICATION TABLES ITP

Using known facts
If 3 x 2 = 6, then 30 x 2 = 60, 60 ÷3 = 20 and 30 = 60 ÷ 2.

Associativity
(2 x 3) x 4 = 2 x (3 x 4)



</td>
<td>

Partitioning strategy to double
Double 35

Place value materials to represent calculations
Diennes and then place value counters.

Partitioning
Informal recording of partitioned numbers
15 x 5 = 75

10 x 5 = 50
5 x 5 = 25

27 x 3 = 81

20x3 = 60
7x3 = 21

"20 multiplied by 3 equals 60 and 7 multiplied by 3 equals 21. 60 add 21 equals 81."

</td>
<td>

Grid method
23 x 8 =
20 x 8 =160
3 x 8 = 24
23 x 8= 184

x	20	3
8		

Short multiplication
Expanded

23
x 8
24 (8 x3)
160 (8 x20)
184

leading to compact
23
x 8
184
2

Decision making
What pair of numbers could be written in the boxes?
☐ x ☐ = 24

Representing problems
A group of aliens live on Planet Xert. Tinions have three legs, Quinions have four legs. The group has 22 legs altogether. How many Tinions and Quinions might there be? Is there more than one solution?

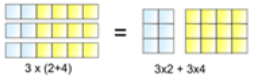
</td>
<td>

Building tables

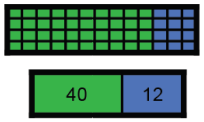
For example, build tables using counting stick- forwards and backwards and with missing jumps

Using known facts
If 2 x 3 = 6 then 200 x 3 = 600 and 600 ÷3 = 200

Distributivity
3 x (2 +4) = 3 x 2 + 3 x 4
So the '3' can be 'distributed' across the '2 + 4' into 3 times 2 and 3 times 4



leading to
13 x 4 = 10 x 4 + 3 x 4 = 52



</td>
<td>

Place value materials to represent calculations

Grid method
(if needed for conceptual understanding)

346 x 9

x	300	40	6
9			

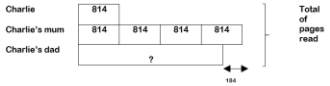
Short multiplication
Expanded

346
x 9
54 (9 x 6)
360 (9 x 40)
2700 (9 x 300)
3114

leading to compact
346
x 9
3114
4 5

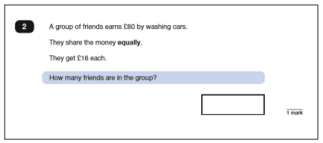
</td>
<td>

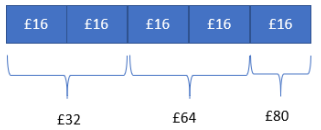
Representing problems
In one month, Charlie read 814 pages in his books. His mum read 4 times as much as Charlie which was 184 pages more than Charlie's dad. How many pages did they read altogether?



Multiply a number by itself and then make one factor one more and the other one less. What do you notice? Does this always happen?

Eg 4 x 4 = 16 6 x 6= 36
5 x 3 = 15 7 x 5= 35
Try out more examples to prove your thinking.





Place <, >, or = in these number sentences to make them correct:
50 x 4 ☐ 4 x 50
4 x 50 ☐ 40 x 5
200 x 5 ☐ 3 x 300

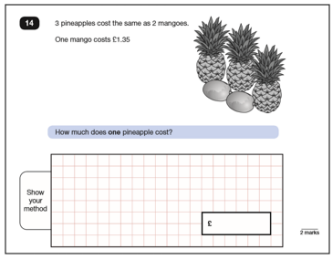
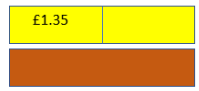
</td>
</tr>
<tr>
<td>With jottings… or in your head</td>
<td colspan="3">Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2 digit numbers times 1 digit numbers using mental methods.
Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems (four times as high, eight times as long etc.) and correspondence problems in which n objects are connected to m objects (3 hats and 4 coats, how many different outfits?).</td>
<td colspan="3">Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
Recognise and use factor pairs and commutativity in mental calculations.
Solve problems involving multiplying and adding, including using the distributive law to multiply 2 digit numbers by 1 digit (39 x7 =30 x 7 + 9 x7), integer scaling problems and harder correspondence problems such as n objects are connected to m objects.</td>
</tr>
<tr>
<td>Known facts</td>
<td colspan="3">Recall and use x and ÷ facts for the 3, 4 and 8 x tables</td>
<td colspan="3">Recall x and ÷ facts for x tables up to 12 x 12.</td>
</tr>
<tr>
<td>Checking strategies</td>
<td colspan="3">Through doubling, connect the 2x, 4x and 8x multiplication tables.
Estimate the answer to a calculation and use inverse operations to check answers.
Develop efficient mental methods, for example, using commutativity and associativity (4 x 12 x 5= 4 x 5 x 12= 20 x 12 = 240 or 4 x 5 x 12</td>
<td colspan="3">Estimate and use inverse operations to check answers to a calculation.
Approximate using the most significant digit, rounding skills.</td>
</tr>
</table>

Multiplication KS2

	= 4 x 60 = 240) and multiplication and division facts to derive related facts.			
Essential knowledge	Review 2x, 5x and 10x	Double 2 digit numbers	4x and 8x tables	10x bigger
	4x table	3x table	3x, 6x and 12x tables	Double larger numbers and decimals
	8 x table	6x table	3x and 9x tables	11x and 7x tables

Year	5	6
Layers of vocabulary  **Appendix 1a** Beck's Tiers of Vocabulary **Appendix 1b:** Vocabulary book	**Basic to subject specific (Beck's Tiers):** lots of, groups of times, multiply, multiplication, multiplied by multiple of, product once, twice, three times… ten times… times as (big, long, wide… and so on) repeated addition array row, column double, halve share, share equally factor, multiple, prime, composite **Instructional vocabulary:** carry on, continue, repeat what comes next? predict describe the pattern, describe the rule find, find all, find different investigate	**Basic to subject specific (Beck's Tiers):** lots of, groups of times, multiply, multiplication, multiplied by multiple of, product once, twice, three times… ten times… times as (big, long, wide… and so on) repeated addition array row, column double, halve share, share equally factor, multiple, prime, composite **Instructional vocabulary:** carry on, continue, repeat what comes next? predict describe the pattern, describe the rule find, find all, find different investigate
NC 2014	Multiply numbers up to 4 digits by a 1 or 2 digit number using a formal written method, including long multiplication for 2 digit numbers Solve problems involving multiplication and division including using knowledge of factors and multiples, squares and cubes Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign Solve problems involving multiplication and division including scaling by simple fractions and problems involving simple rates	Multiply multi-digit numbers up to 4 digits by a 2 digit whole number using the formal written method of long multiplication. Solve problems involving addition, subtraction, multiplication and division.
Developing Conceptual/ Procedural Understanding	**Building tables** **For example, apply tables knowledge to multiples of 10, 100 and 1000 using counting stick- forwards and backwards and with missing jumps** **Grid method (if needed for conceptual understanding)** **28 x 27**  **Addition to be done mentally or across leading to compact** 28 x 27 196 5 560 1 756 1	**Building tables**  **For example, apply tables knowledge to decimals using counting stick- forwards and backwards and with missing jumps** **Using known facts** **If 2 x 3 = 6 then 0.2 x 3 =0.6 and 0.02 x 3 = 0.06** **If place value is secure, use grid method for decimal multiplication** **0.75 x 6** **0.7 x 6 = 4.2** **0.05 x 6 = 0.3** **0.75 x 6 = 4.5** **Make explicit links between decimals**

Multiplication KS2

	Using known facts If 2 x 3 = 6 then 2000 x 3 = 6000 and 200 x 30 = 6000 **Place value materials to represent calculations** Place value counters **Short multiplication** Use expanded method first if needed to build conceptual understanding 4346 x 8 34768 2 3 4	followed by column addition **Long multiplication** Expanded 28 x 27 56 (7x8) 140 (7 x20) 160 (20x8) 400 (20x20) 756	Extend to HTU x TU or ThHTU x TU as appropriate **Decision making** Children investigate alternative methods such as compensation strategies and doubling and halving and discuss when these might be most appropriate and efficient. Examples: 24x99 could be calculated by x100 and subtracting 24x1. 24 x25 could be calculated by 24x100, halving to find x50 and halving again to find x 25. or using doubling and halving, 24 x25=12x50 =6 x100 **Representing problems** 40 cupcakes cost £3.60, how much do 20 cupcakes cost? How much do 80 cupcakes cost? How much do 10 cupcakes cost?	**Long multiplication** Use expanded method first if needed to build conceptual understanding 5172 x 27 36204 1 5 1 103440 1 139644	**and money** x | 0.7 | 0.05 6 | | **Decision making** Kim knows that 137 x 28= 3836. Explain how she can use this information to work out this multiplication: 138 x 28 Mike works out that 14 × 12 = 168. What is 14 × 1.2? How do you know? 'When you multiply two numbers together, the answer is always greater than either of the numbers you started with.' Is Alfie correct? Explain how you know. **Representing problems** Amy is given the calculation 5413 x 600. She says "I can do this without a written method." Write down the mental steps you think Amy could do.  
With jottings… or in your head	Multiply and divide numbers mentally drawing upon known facts Partition to multiply mentally Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers Establish whether a number up to 100 is prime			Perform mental calculations, including with mixed operations and large numbers Use knowledge of the order of operations to carry out calculations involving the four operations (2 +1 x 3= 5 and (2+1) x 3 = 9)	
Known facts	Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers			Identify common factors, common multiples and prime numbers	

Multiplication KS2

<table>
<tr><td></td><td colspan="2">Recall prime numbers up to 19
Recognise and use square and cube numbers and the notation for squared (^{2}) and cubed (^{3})</td><td colspan="2"></td></tr>
<tr><td>Checking strategies</td><td colspan="2">Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
Promote decision making so that pupils choose an appropriate method/strategy.</td><td colspan="2">Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</td></tr>
<tr><td rowspan="3">Essential knowledge</td><td>4x and 8x tables</td><td>100, 1000 times bigger</td><td rowspan="3">Multiplication facts up to 12 x 12

Apply place value to derive multiplication facts, e.g. 3 x 4 = 12 so 3 x 0.4 = 1.2</td><td>Partition to multiply mentally</td></tr>
<tr><td>3x, 6x and 12x tables; 3x and 9x tables</td><td>10, 100, 1000 times smaller</td><td>Double larger numbers and decimals</td></tr>
<tr><td>11x and 7x tables</td><td>Double larger numbers and decimals</td><td></td></tr>
</table>