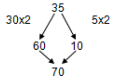
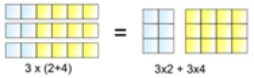
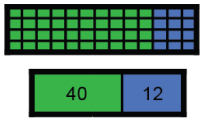
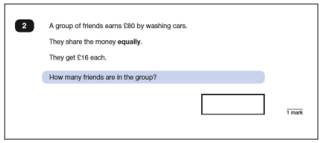
Multiplication and Division Key Stage 1 to Key Stage 2

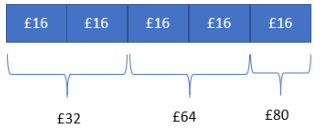
KS1	Pupils should memorise and reason with numbers in 2, 5 and 10 times tables. They should see ways to represent odd and even numbers and know how they are represented in tables. This will help them to understand the pattern in numbers. Pupils should begin to understand multiplication as scaling in 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 Multiplication	4 Multiplication
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 and Division Key Stage 1 to Key Stage 2

<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
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
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
<table><tr><td>x</td><td>20</td><td>3</td></tr><tr><td>8</td><td></td><td></td></tr></table>
Short multiplication
Expanded
23
x 8
24 (8 x3)
160 (8 x20)
184
leading to compact
23
x 8
184
2
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
<table><tr><td>x</td><td>300</td><td>40</td><td>6</td></tr><tr><td>9</td><td></td><td></td><td></td></tr></table>
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
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.
 

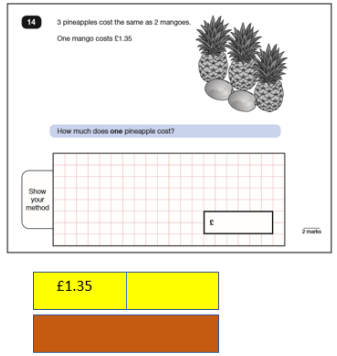
 

Place <, >, or = in these number sentences to make them correct:
50 x 4 4 x 50
4 x 50 40 x 5
200 x 5 3 x 300</td>
</tr>
<tr>
<td>Known facts</td>
<td colspan="3">Recall and use x and ÷ facts for the 3, 4 and 8 x tables</td>
<td colspan="3">Recall x and ÷ facts for x tables up to 12 x 12.</td>
</tr>
<tr>
<td rowspan="3">Essential knowledge</td>
<td>Review 2x, 5x and 10x</td>
<td>Double 2 digit numbers</td>
<td>4x and 8x tables</td>
<td colspan="2">10x bigger, 100 x bigger</td>
</tr>
<tr>
<td>4x table</td>
<td>3x table</td>
<td>3x, 6x and 12x tables</td>
<td colspan="2">Double larger numbers and decimals</td>
</tr>
<tr>
<td>8 x table</td>
<td>6x table</td>
<td>3x and 9x tables</td>
<td colspan="2">11x and 7x tables</td>
</tr>
</table>

Multiplication and Division Key Stage 1 to Key Stage 2

Year	5 Multiplication			6 Multiplication	
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** **Using known facts** **If 2 x 3 = 6 then 2000 x 3 = 6000 and 200 x 30 = 6000** **Place value materials to represent calculations**	**Grid method (if needed for conceptual understanding)** **28 x 27** x | 20 | 8 20 | | | 7 | | | **Addition to be done mentally or across followed by column addition** **Long multiplication** Expanded 28 x 27 56 (7x8) 140 (7 x20) 160 (20x8) 400 (20x20) 756	leading to compact 28 x 27 196 5 560 1 756 1 **" Place a zero to hold the ones, as everything is ten times bigger."** **Extend to HTO x TO or ThHTO x TO as appropriate** **Representing problems** **40 cupcakes cost £3.60, how much do 20 cupcakes cost? How much do 80 cupcakes**	**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** **Long multiplication** **Use expanded method first if needed to build conceptual understanding** 5172 x 27 36204 1 5 1 103440 1 139644	**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 and money** x | 0.7 | 0.05 6 | | **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.**

Multiplication and Division Key Stage 1 to Key Stage 2

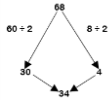
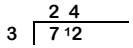
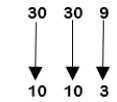
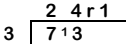
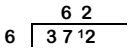
<table>
<tr><td></td><td colspan="2">Short multiplication
Use expanded method first if needed to build conceptual understanding
4346
x 8
34768
2 3 4</td><td colspan="2">cost? How much do 10 cupcakes cost?</td><td colspan="2"> 

</td></tr>
<tr><td>Known facts</td><td colspan="3">Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
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="3">Identify common factors, common multiples and prime numbers
 
</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</td><td colspan="2">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 colspan="2">Double larger numbers and decimals</td></tr>
<tr><td>11x and 7x tables</td><td>Double larger numbers and decimals</td><td colspan="2">10 x smaller
100 x smaller</td></tr>
</table>

Multiplication and Division Key Stage 1 to Key Stage 2

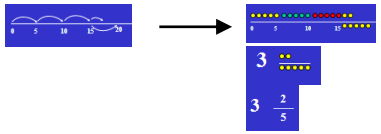
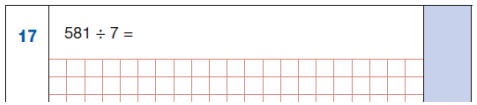
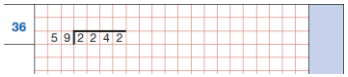
KS1	Noticing how counting in multiples if 2, 5 and 10 relates to the number of groups you have counted (introducing times tables) links to division. An understanding of the more you share between, the less each person will get (e.g. would you prefer to share these grapes between 2 people or 3 people? Why?) Secure understanding of grouping means you count the number of groups you have made. Whereas sharing means you count the number of objects in each group.	
Year	**3 Division**	**4 Division**
Layers of vocabulary  **Appendix 1a** Beck's Tiers of Vocabulary **Appendix 1b:** Vocabulary book	**Basic to subject specific (Beck's Tiers):** share, share equally one each, two each, three each… group in pairs, threes… tens equal groups of ÷, divide, division, divided by, divided into left, left over, remainder, dividend, divisor **Instructional vocabulary:** calculate, work out, solve, investigate question, answer, check	**Basic to subject specific (Beck's Tiers):** share, share equally one each, two each, three each… group in pairs, threes… tens equal groups of ÷, divide, division, divided by, divided into left, left over, remainder, dividend, divisor **Instructional vocabulary:** calculate, work out, solve, investigate, question, answer, check
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.	Practise to become fluent in the formal written method of short division with exact answers.

Multiplication and Division Key Stage 1 to Key Stage 2

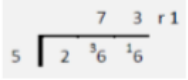
Developing Conceptual/ Procedural Understanding	**Links to tables**  For example, use language of division linked to tables using counting stick **Using known facts** If 3 x 2 = 6, then 30 x 2 = 60, 60 ÷3 = 20 and 30 = 60 ÷ 2. **Partitioning strategy to halve** Halve 68  **Rearranging the dividend to find multiples of the divisor.** 48 ÷ 3 = 'What do I know about the 3 x tables?' "I know 3 x 10 = 30 and 3 x 6 = 18."  48 ÷ 3 = 16	**Place value materials to represent calculations** **Introduce the 'bus stop' bracket and vinculum notation.** **Short division** 72 ÷ 3 =  '72 divided by 3. 7 tens shared equally between 3 is 2 with a remainder of 1 ten. Exchange the 1 ten for 10 ones. I now have 12 ones which shared equally between 3 is 4. The answer is 24." **Representing problems** Andy says 'I can use my three times table to work out 180 ÷ 3'. Explain what Andy could do to work out this calculation.	**Links to tables**  For example, use language of division linked to tables using counting stick **Using known facts** If 2 x 3 = 6 then 200 x 3 = 600 and 600 ÷3 = 200 **Rearranging the dividend to find multiples of the divisor.** 69÷ 3 = 'What do I know about the 3 x tables?' "I know 3 x 10 = 30 and 3 x 3 = 9."  69 ÷ 3 = 23  **Remainders can never be greater than the divisor.**	**Place value materials to represent calculations** **Short division** 372 ÷ 6 =  '372 divided by 6. 3 hundreds cannot be shared equally between 6, so exchange the hundreds for 30 tens. I now have 37 tens which shared equally between 6 is 6 with a remainder of 1 ten. Exchange the ten for 10 units. I now have 12 ones which shared equally between 6 is 2. The answer is 62." **Representing problems** Alan says that the solution to 186 ÷ 4 can be written as '46 remainder 2' or as '46.5'. Do you agree? Explain your answer.
Known facts	Recall and use x and ÷ facts for the 3, 4 and 8 x tables		Recall x and ÷ facts for x tables up to 12 x 12.	
Essential knowledge	Review division facts (2 x, 5 x and 10 x tables)	Halve 2 digit numbers	Division facts (4x and 8x tables)	10x smaller
	Division facts (4 x table)	Division facts (3 x table)	Division facts (3 x, 6 x and 12 x tables)	Halve larger numbers and decimals
	Division facts (8 x table)	Division facts (6 x table)	Division facts (3 x and 9 x tables)	Division facts (11 x and 7 x tables)
Tests of divisibility	KS1: 2, 5, 10	Any number with a digit sum of a multiple of 3, will divide equally by 3	Any number with a digit sum of a multiple of 3, will divide equally by 3 KS1: 2, 5, 10	Any number with a digit sum of a multiple of 3 and is even will divide equally by 6

Year	5 Division	6 Division
Layers of vocabulary  **Appendix 1a** Beck's Tiers	**Basic to subject specific (Beck's Tiers):** equal groups of divide, division, divided by, divided into remainder factor, quotient, divisible by inverse **Instructional vocabulary:** calculate, work out, solve, investigate question, answer, check same, different missing number/s number facts, number pairs, number bonds	**Basic to subject specific (Beck's Tiers):** equal groups of divide, division, divided by, divided into remainder factor, quotient, divisible by inverse, remainders as fractions or decimals **Instructional vocabulary:** calculate, work out, solve, investigate question, answer, check

Multiplication and Division Key Stage 1 to Key Stage 2

of Vocabulary **Appendix 1b:** Vocabulary book	greatest value, least value	same, different missing number/s number facts, number pairs, number bonds greatest value, least value
NC 2014	Divide numbers up to 4 digits by a 1 digit number using the formal written method of short division and interpret remainders appropriately for the context (as remainders, as fractions, as decimals or by rounding, e.g. 98 ÷ 4 = $\frac{98}{4}$ = 24 r2 = 24 ½= 24.5 ≈ 25). 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.	Divide numbers up to 4 digits by a 2 digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate to the context. Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. Solve problems involving addition, subtraction, multiplication and division.
Developing Conceptual/ Procedural Understanding	**Using known facts** **If 6 ÷ 2 = 3 then 6000 ÷ 2 = 3000 and 6000 ÷ 20 = 300** **Place value materials to represent calculations** **Short division** **483 ÷ 7 =** 6 9 r1 7 | 4 48 64 **"484 divided by 7. 4 hundreds cannot be shared equally between 7, so exchange the hundreds for 40 tens. I now have 48 tens which shared equally between 7 is 6 with a remainder of 6 tens. Exchange the 6 tens for 60 ones, we now have 64 ones. 64 shared equally between 7 equals 9 remainder 1. The answer is 69 r1."**	**Interpreting remainders** **17 ÷ 5** **"What do I know? 17 is not a multiple of 5."**  3 2/5 **3 2/5 = 3.4** **From knowledge of decimal/fraction equivalents or by converting $\frac{2}{5}$ into $\frac{4}{10}$.** **Examples:**  **581 ÷ 7 could be calculated by the formal written method of short division or it could be calculated by rearranging the dividend, using known facts, into 560 and 21.** **Representing problems** **Correct the errors in the calculation below. Explain the error. 266 ÷ 5 = 73.1**	**Using known facts** **If 6 ÷ 2 = 3 then 6÷ 0.2 = 30 and 6 ÷ 0.02 = 300** **Short division** **97.6 ÷ 5 =** 1 9 . 5 2 5 | 9 47. 26 10 **"97.6 divided by 5. 9 tens shared equally between 5 is 1 with a remainder of 4 tens. Exchange the ten for 10 ones. I now have 47 units which shared equally between 5 is 9 with a remainder of 2 ones. Exchange the 2 onesfor 20 tenths, we now have 26 tenths. 26 shared equally between 5 equals 5 with a remainder of 1 tenth. Extend the dividend with a 0 in the hundredths column. Exchange the tenth for 10 hundredths. 10 shared equally between 5 equals 2. The answer is 19.52."** **Long division** **(thinking not generally recorded)** **384 ÷ 16** 1 16 2 32 4 64 5 80 8 128 10 160 **"What do I know about the divisor?" Record partial tables.** 24 16 | 384 -32 (38 tens ÷16 = 2 r6; 2 x 16 =32) 64 (bring the 4 down) -64 (64 units ÷ 16 =4) 0 (no remainder)	 **With questions of this type where the divisor is close to a number linked to the times tables, encourage the children to use known facts and adjustment to set up the partial tables.** Adjust 1 60 -1 59 2 120 -2 118 4 240 -4 236 5 300 -5 295 8 480 -8 472 10 600 -10 590 **Representing problems** **Megan divides 500 by 8 and gets the answer 62r4. She re writes it as 62 r 1/2 . Is she right? Explain your answer.** **Using factors to simplify long division** 25) 815

Multiplication and Division Key Stage 1 to Key Stage 2

				$\frac{165}{5\overline{)815}}$ $\frac{35}{5\overline{)165}}$ **Simplify the fractions for remainders**
Known facts	Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. Recall prime numbers up to 19		Identify common factors, common multiples and prime numbers	
Essential knowledge	Division facts (4 x and 8 x tables)	100, 1000 times smaller	Division facts up to 12 x 12	Halve larger numbers and decimals
	Division facts (3 x, 6 x and 12 x tables; 3 x and 9 x tables)	Partition to divide mentally	Apply place value to derive division facts, e.g. 12 ÷3 = 4 so 1.2 ÷3 = 0. 4	Partition to divide mentally including decimals
	Division facts (11 x and 7 x tables)	Halve larger numbers and decimals		
Tests of divisibility	Tests for 2,3,5,6 &10	Any number with a digit sum of a multiple of 9 will divide equally by 9	Tests for 2,3,5,6, 9 & 10	Any number where the last two digits are divisible by 4, will all divide by 4