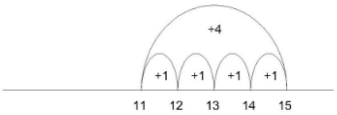
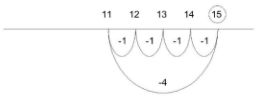
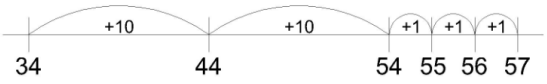
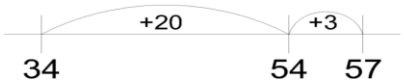
Calculation Methods - Progression in New Curriculum

	Addition	Subtraction
Rec	**To use drawings/pictures to add number together under 10.** 2+3= At a party, I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether? 	**To use drawings/pictures to subtract two numbers under 10.** 5-2= I had five balloons. Two burst. How many did I have left? 
Year 1	**Add one-digit and two-digit numbers to 20, including zero.** Children could use dots or tally marks to represent objects (quicker than drawing a picture). 7+4= 7 people are on the bus. 4 more get on at the next stop. How many people are on the bus now?  Children then begin to use numbered number lines to support their own calculations by counting on in ones. Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.  When children are ready they then move onto counting on in ones on a blank number line. 11 + 4 = 15 	**Subtract one-digit and two-digit numbers to 20, including zero.** Using dots or tally marks is quicker than drawing a detailed picture. 7-3= Mum baked 7 biscuits. I ate 3. How many were left?  Lisa has 7 felt tip pens and Tim has 3. How many more does Lisa have?  Children then begin to use numbered number lines to support their own calculations by counting back in ones. When children are then ready they move onto counting back in ones on a blank number line. 15 - 4 = 11 
Year 2	**Add using concrete objects, pictorial representations, and mentally, including:** • a two-digit number and ones • a two-digit number and tens • two two-digit numbers • adding three 1 digit numbers • Children will begin to use 'empty number lines' themselves starting with the larger number and counting on. **First counting on in tens and ones.** 34 + 23 = 57  ***Followed by adding the tens in one jump and the units in one jump.** 	**Subtract using concrete objects, pictorial representations, and mentally, including:** • a two-digit number and ones • a two-digit number and tens • two two-digit numbers 34-13= 21 I cut 13cm off a ribbon measuring 34cm. How much is left?  or 84 - 27 = 57 

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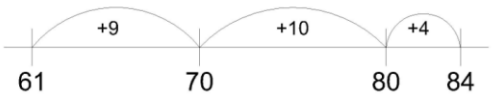
	Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. Leading onto mental partitioning. **34 + 23** T → 30 + 20 = 50 U → 4 + 3 = 7 Recombine → 50 + 7 = 57	We also use a numberline to count on to find the difference between 2 numbers when the first number is more than half of the second number (i.e. they are close together). 84 – 61 = 23 
Year 3	**Add numbers mentally, including:** • a three-digit number and ones • a three-digit number and tens • a three-digit number and hundreds Record mental methods using partitioning. **132 + 46** H → 100 + 0 = 100 T → 30 + 40 = 70 U → 2 + 6 = 8 Recombine → 100 + 70 + 8 = 178 **Add numbers with up to three digits, using formal written methods of columnar addition (column partitioning).** 461 + 123 400 + 60 + 1 100 + 20 + 3 500 + 80 + 4	**Subtract numbers mentally, including:** • a three-digit number and ones • a three-digit number and tens • a three-digit number and hundreds **Subtract numbers with up to three digits, using formal written methods of columnar subtraction (column partitioning).** 174 – 62 **H T U** 100 70 4 60 2 100 + 10 + 2 Partitioning the numbers into hundreds (H), tens (T) and units (U) and writing one under the other mirrors the column method. When subtracting tens it is important to say 'twenty' (not two) so that place value is reinforced. This does not link directly to mental methods of counting back or up but parallels the partitioning method for addition. It also relies on secure mental skills.
Year 4	**Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate.** 1456 +321 7 (6 + 1) 70 (50 + 20) 700 (400 + 300) 1000 (1000 + 0) 1777	**Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate (partitioning and decomposition).** 741 – 367 $700 + 40 + 1$ $-\ 300 + 60 + 7$ $\overset{600}{\cancel{700}} + \overset{130}{\cancel{40}} + \overset{11}{\cancel{1}}$ $-\ 300 + 60 + 7$ $300 + 70 + 4$ $\overset{6}{\cancel{7}}\ \overset{13}{\cancel{4}}\ \overset{11}{\cancel{1}}$ $-\ 3\ 6\ 7$ $3\ 7\ 4$ Children will begin to exchange first with units, then tens and then hundreds.
Year 5	**Add whole numbers with more than 4 digits, including using formal written methods (columnar addition).** Children should extend the carrying method to numbers with at least four digits, including decimals. 32651 +24987 57638 1 1	**Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction).** 932 – 457 becomes $\overset{8}{\cancel{9}}\ \overset{12}{\cancel{3}}\ \overset{1}{\cancel{2}}$ $-\ 4\ 5\ 7$ $4\ 7\ 5$ Answer: 475 Children will then move onto larger numbers as they become secure and confident.

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Year 6	**Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.** Children should extend the carrying method to numbers with any number of digits, including decimals. 12,786 people visited the museum in 2012. The numbers increased by 2,568 in 2013. In 2014 3,421 visited. How many people altogether visited over the 3 year period? 12786 + 2568 3421 18775 111	**Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why.** Children should extend the decomposition method to numbers with any number of digits, including decimals. Numberlines and mental methods should also be used, if more efficient than decomposition. (e.g. with very close numbers). From a 5 litre jug of water 2.35 litres is poured it, then a further 1.5 litres. How much water is left in the jug?

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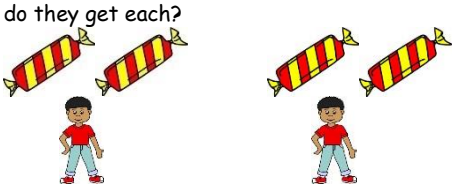
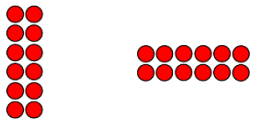
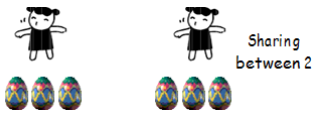
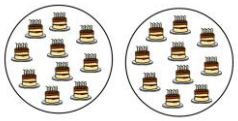
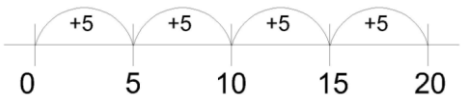
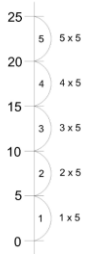
	Multiplication	Division
Rec	When children are ready they will begin to use physical, visual and pictorial representations. 4x2= Each child has two eyes. How many eyes do four children have?  	When children are ready they will begin to share by 2 (halving) through physical, visual and pictorial representations with numbers up to 10. 4 sweets are shared equally between 2 children. How many do they get each? 
Year 1	**Solve one-step problems involving x, by calculating the answer using concrete objects, pictorial representation and arrays.** Marbles cost 2p each. How much would 6 cost?  **2 and 10 x tables**	**Solve one-step problems involving ÷, by calculating the answer using concrete objects, pictorial representation and arrays.** 6÷2= 6 Easter eggs are shared between 2 children. How many eggs do they get each?  There are 6 Easter eggs. How many children can have 2 each?  This will then lead onto "ducks in ponds", which children will understand as sharing equally. 20 cakes are shared between 2 cake stalls. How many cakes are on each stall? 
Year 2	**Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs** **Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication, including problems in contexts.** Children could count on in equal steps, recording each jump on an empty number line. 4 x 5 = 20 There are 4 cats. Each cat has 5 kittens. How many kittens are there altogether?  **3 and 5 x tables**	**Calculate mathematical statements for division within the multiplication tables and write them using the, division (÷) and equals (=) signs** **Solve problems involving division, using materials, arrays, repeated addition, mental methods, and division facts, including problems in contexts.** In Year 2 children will continue to share equally using "ducks in ponds" but with their 2, 3, 5 and 10 x tables. They will then move onto vertical chunking up on a number line. 

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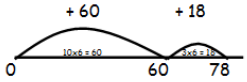
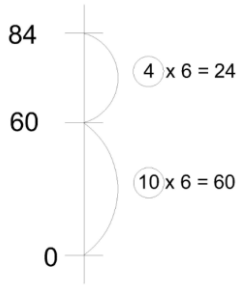
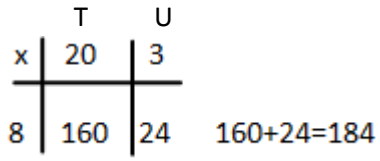
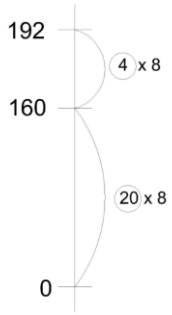
Year 3	**Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.** When numbers get bigger, it is inefficient to do lots of small jumps. Partition 13 into tens and units (10 and 3). This gives you two jumps (10x6 and 3x6). There are 13 biscuits in a packet. How many biscuits are in 6 packets?  13x6 = **The number line then builds on towards partitioning.** 13 x 6 = (10 x 6) + (3 x 6) = 60 + 18 = 78 **4, 6 and 8 x tables**	**Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divide one-digit numbers, using mental and progressing to formal written methods.** Children will consolidate vertical "chunking up", extending to the 4, 6 and 8 times tables, including problems with remainders. I need 6 drawing pins to put up a picture. How many pictures can I put up with 84 pins? 84 ÷ 6 = 14 
Year 4	**Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.** **Grid method: TU x U** (Short multiplication – multiplication by a single digit) 23 x 8 (Children will approximate first and then check their final answer against their approximation). 23 x 8 is approximately 25 x 8 = 200. They will draw their grid proportionally so that they recognise the value of the digits.  160+24=184 Children will then move onto 3 digit numbers multiplied by a 1 digit number. **7, 9, 11 and 12 x tables**	**Divide 3 digit numbers by a 1 digit number, including problems and remainders.** In Year 4 children will move onto "chunking up" for division. As they become more confident they will be encouraged to use larger chunks and apply their times table and place value knowledge. (i.e. 20 x 8 added to 4 x 8). 192÷8 = 24 8 pencils fit in each packet. If you have 192 pencils, how many packets can be filled? 
Year 5	**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.** Children will spend time consolidating the grid method with larger numbers, including decimals. When ready, they will then move onto compact short multiplication. 2741 x 6 becomes  Answer: 16 446	**Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.** Continue to use "chunking up". When children are fluent and manipulating numbers accurately they can be moved onto short division (bus stop method). Children could use the reverse grid method as a checking strategy. 3642 ÷ 3 = 1214 1 2 1 4 3) 3 6 4 ^{1}2 As pupils become more confident they can work with remainders, decimals and decimal remainders.

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Year 6	**Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.** When children can calculate competently and accurately, understanding the layout and place value of the digits they will move onto long multiplication. 124 × 26 becomes 1 2 1 2 4 × 2 6 2 4 8 0 (124 x 20) 7 4 4 (124 x 6) 3 2 2 4 1 1 Answer: 3224	**Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.** E.g. 1 2 3 . 6 12)1¹4²7 ³8. ²4 **Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.** **(Long division)** 432 ÷ 15 becomes 2 8 · 8 1 5 | 4 3 2 · 0 3 0 ↓ 1 3 2 1 2 0 1 2 0 1 2 0 0 Answer: 28·8 **(Repeated subtraction)** 432 ÷ 15 becomes 2 8 1 5 | 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 $\frac{12}{15} = \frac{4}{5}$ Answer: $28\frac{4}{5}$ Children should use the most efficient method in the context of the problem.