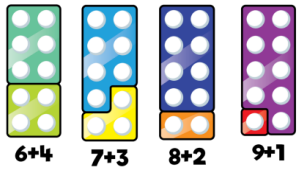
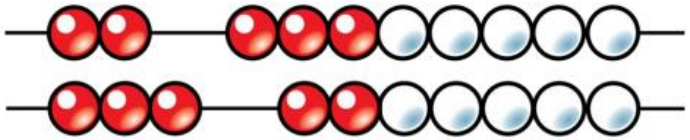
Guildhall Feoffment Community Primary School

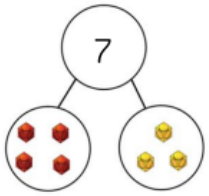
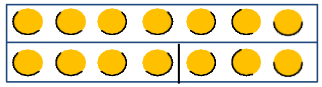
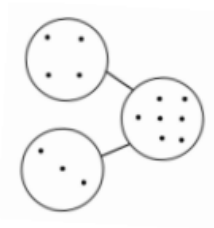
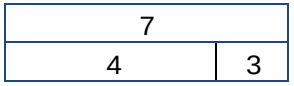
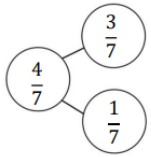
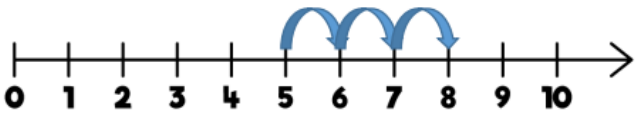
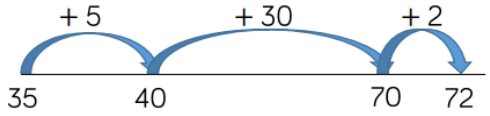
Calculation Policy

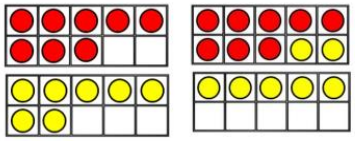
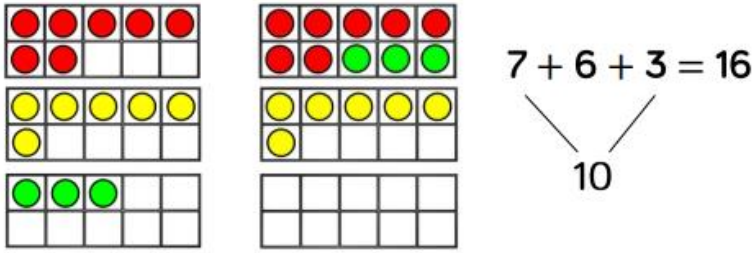
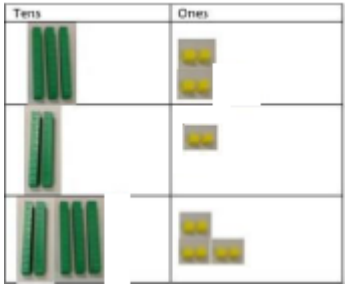
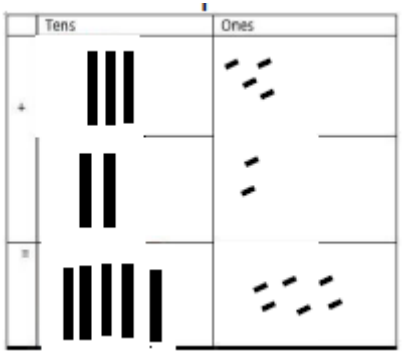
2023

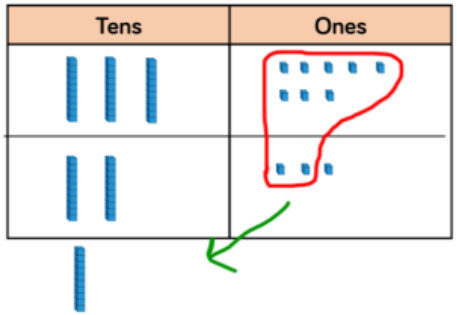
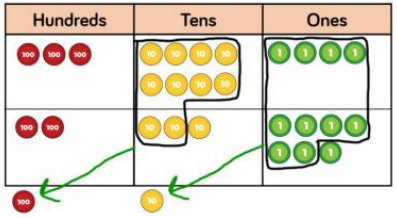
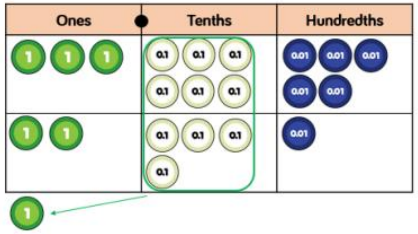
Calculation policy: Addition

Key language: sum, total, parts and wholes, plus, add, altogether, more, ‘is equal to’ ‘is the same as’.

	Concrete	Pictorial	Abstract
Number bonds to 10	Numicon is useful to allow children to see how the parts come together to make a whole. With repetition, they can start to subitise the total due to their familiarity with the shape of each number. **Reception into Year 1**  	Children will begin to draw numicon and build confidence working backwards, identifying the missing shape/number.  Alternative method: Bead strings are useful for investigating bonds to 10. Children can work systematically by moving an additional bead each time. 	**Year 1** Children will develop fluency recalling number bonds to 10. This is essential to later addition work in KS1 and KS2. 5 + 5 = 10 4 + 6 = 10 3 + 7 = 10 2 + 8 = 10 1 + 9 = 10

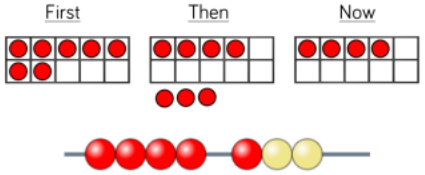
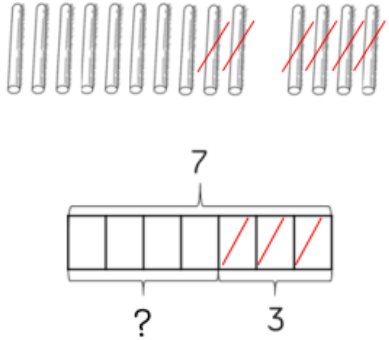
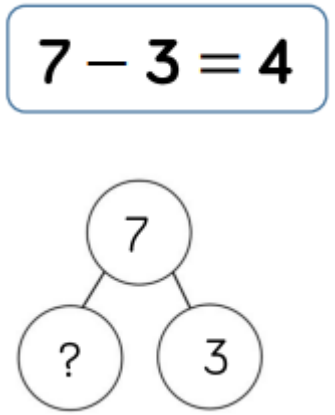
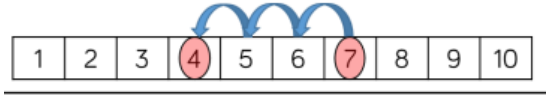
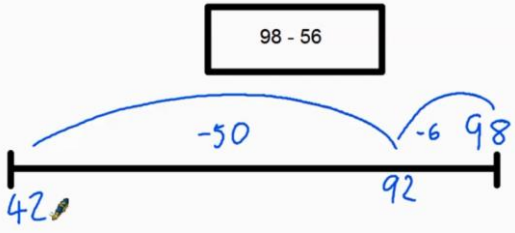
	Concrete	Pictorial	Abstract
Part-whole model /bar model	**Combining two parts to make a whole** (use other resources too e.g. eggs, shells, teddy bears, cars). **Reception into Year 1** 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. **Reception into Year 1**  	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. **Reception into Year 1**  In **KS2**, children can also use the part-whole model to partition and add fractions, decimals and percentages. 
Number lines (labelled and blank)	**Counting on using cubes or Numicon on a number line.** **Reception into Year 1** 	Number lines are useful for encouraging children to count on, rather than count all. Children can place a one finger on their starting number and count on with the other hand until they find the total. **Reception into Year 1** 5 + 3 = 8 	The blank number line provides children with a structure to add in smaller parts, for example jumping to the nearest 10 first. **Year 1 into Year 2** 35 + 37 = 72 

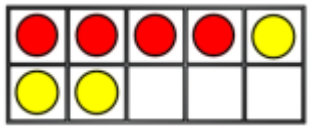
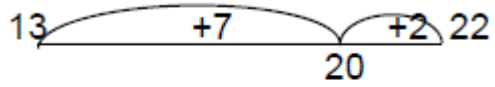
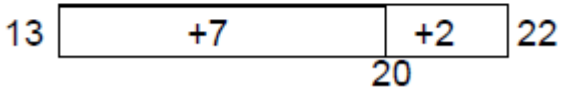
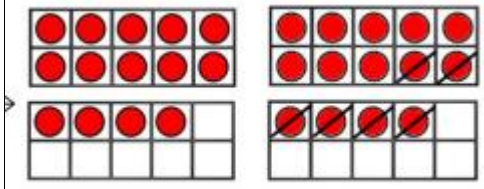
	Concrete	Pictorial	Abstract
Regrouping to make 10 (Bridging)	Using ten frames and counters/cubes or using Numicon. This is also useful for adding 3 single digit numbers and is an essential skill for column addition later. **Reception into Year 1** (8 + 7) 	Children to draw the ten frame and counters/cubes. **Year 1**  	Children to develop an understanding of equality. **Year 1** 6 + 5 = 11 5 + 5 + 1 = 11
Base 10/dienes (2 digit addition, no regrouping)	**2 digit + 1 digit with Base 10** **Year 1** Continue to build understanding of place value, e.g. 34 is 3 tens and 4 ones. 22 is 2 ten and 2 ones. 4 + 2 = 6 30 + 20 = 50 34 + 22 = 56  	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. This also requires the children to be proficient in counting in tens first. **Year 1 into Year 2**  	**Year 1 into Year 2** Children progress onto completing sums like this in by partitioning into tens and ones in their head. Then, in Year 2, children begin to use formal written methods, which soon progresses to include 3 and 4 digit numbers in Year 3 and 4. 

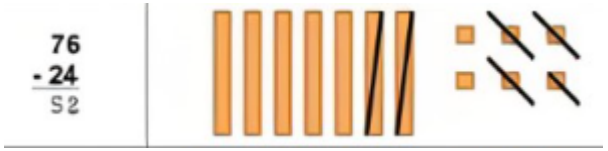
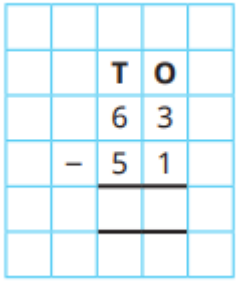
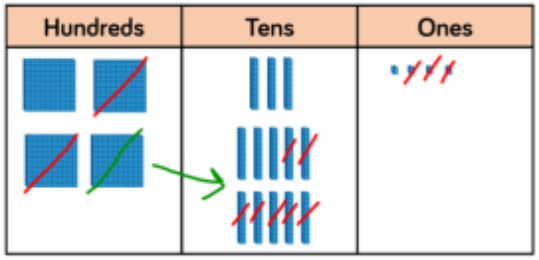
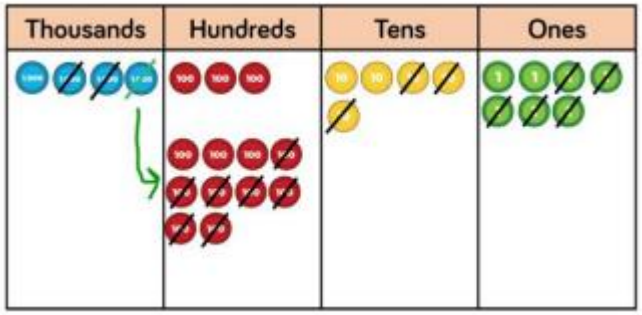
	Concrete	Pictorial	Abstract
Base 10/dienes, with regrouping)	**Year 2 into Year 3** Continue to develop understanding of partitioning and place value. When adding, always start with the smallest value column (in this case, the ones). Where the ones add to a total greater than 9, 10 ones can be exchanged for 1 ten)	**Year 2 into Year 3** Children to represent the base 10 in a place value chart. Where the ones adds to a total greater than 9 , circle 10 ones and draw an additional ten. 	**Year 2 into Year 3** Formal written method for multiplication: 38 + 23 61 1
Place value counters to add numbers longer than 3 digits	**Year 3** The Base 10 model is efficient up to 4 digits, then place value counters are used with larger numbers and decimals.  When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.	**Year 3 into 4** Children to represent the counters in a place value chart, circling when they make an exchange. 	**Year 4, 5 and 6** Formal written method 384 + 237 621 1 1 3.65 + 2.41 6.06 1

Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease, how much more.

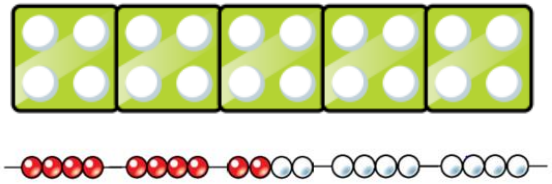
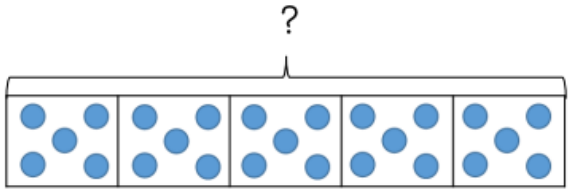
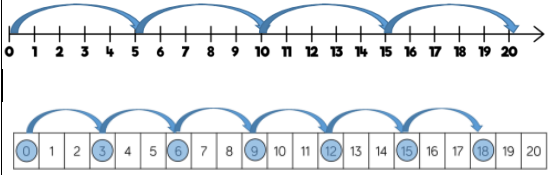
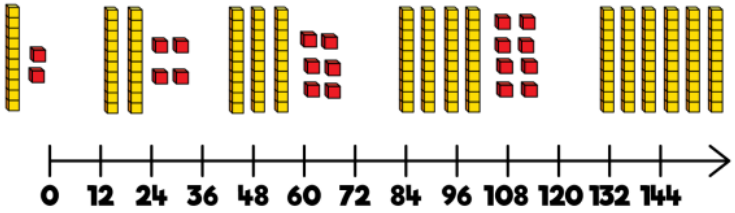
	Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole	Ten frames, Numicon, cubes, bead strings, counters, etc. **Reception into Year 1** 7-3 = 4 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. **Reception into Year 1** 	**Reception into Year 1** 
Counting back	Children use number lines or number tracks, starting with the larger number and counting backwards. **Reception into Year 1**  **Year 2** Progress to two digit numbers, jumping in tens then ones.		Children to represent calculation on a number line or number track and show their jumps. Encourage them to use an empty number line. 

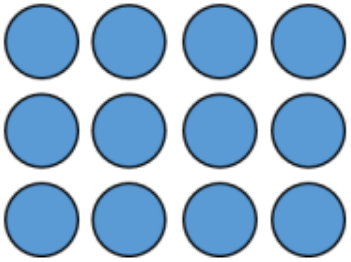
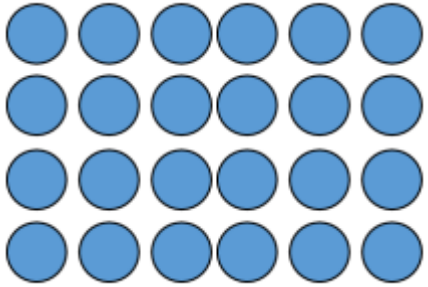
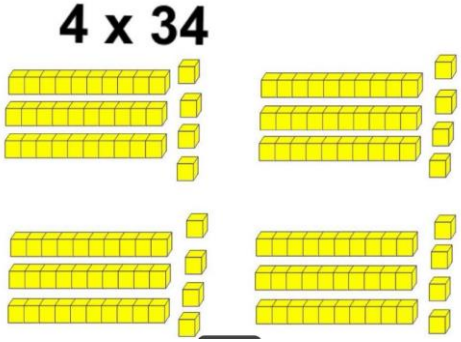
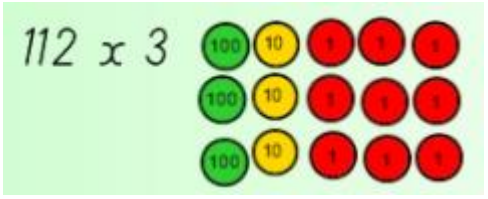
	Concrete	Pictorial	Abstract
Finding the difference	Children to use number lines, number tracks, cubes and other manipulatives to find the difference by counting on from the lower number. **Reception into Year 1** 	Children to use blank number line to count on from lowest number, first getting to the nearest ten. This can also be represented on a bar model. **Year 1 into Year 2**  Bar model 	Children can find the difference by counting on mentally or orally. This model is encouraged as the most efficient when children are subtracting numbers close to the number being subtracted from, e.g. 17 – 15. **Year 1 into Year 2**
Bridging 10	This method is suitable for 2-digit subtract 1-digit calculations. Children to use ten frames and numicon to make (bridge) 10. **Reception into Year 1** 14-6 	Children to show on number line how they partitioned the subtrahend to make 10. **Year 1** 	Children to show how they can subtract by making 10. **Year 1** 14-5 14 – 4 = 10 10 – 1 = 9

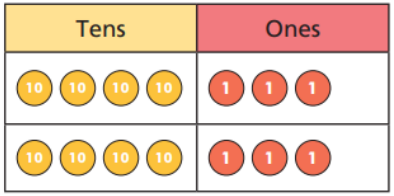
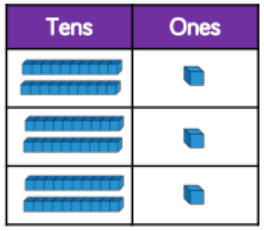
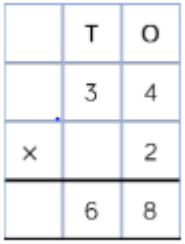
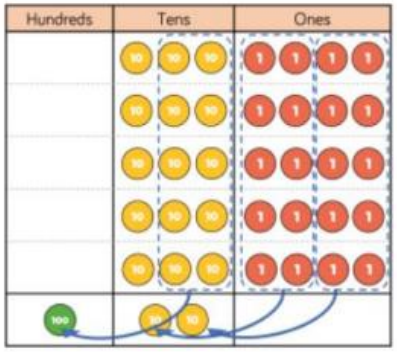
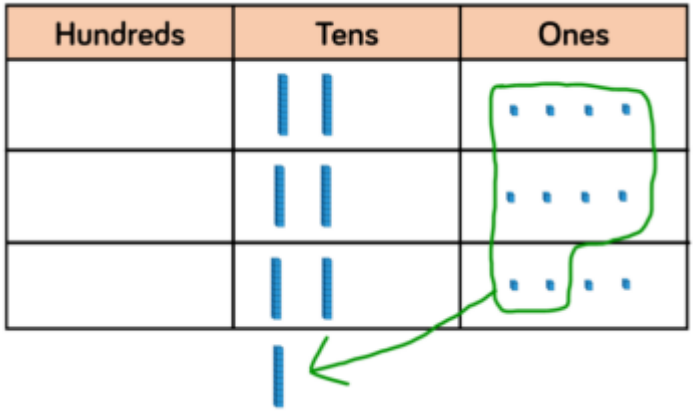
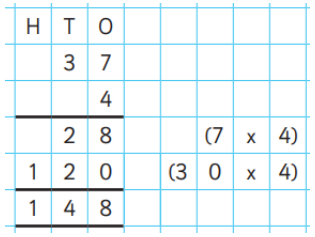
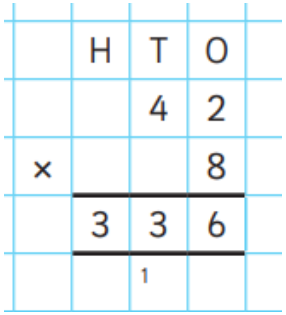
	Concrete	Pictorial	Abstract
Column subtraction (no exchanging)	Base 10 blocks and place value counters are the most efficient manipulatives when subtracting up to 4 digit numbers. Children will build the first number and then subtract, starting with the lowest value column. **Year 2 (2 digit numbers)** **Year 3 (3 digit numbers)** **Year 4 (4 digit numbers)** **Year 5/6 (5 and 6 digit numbers and decimals)**	Children to represent the Base 10 pictorially, crossing out as they subtract. 	Children to use formal column method. 
Column subtraction (exchanging)	Children use Base 10 blocks and place value counters for subtraction of up to 4-digit numbers, exchanging when necessary. 	Children to represent the Base 10 or counters pictorially, crossing out to show the exchange. 	Children will work in the formal column method with increasingly larger numbers and decimals. 3 1 4357 – 2735 1622 4 1 5.43 – 2.7 2.73

Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups, repeated addition .

	Concrete	Pictorial	Abstract
Repeated addition	**Reception into Year 1** Children can use numicon, bead strings and counters to build their understanding of multiplication as repeated addition.  5 x 4 = 4 + 4 + 4 + 4 + 4 = 20	Children to represent the practical resources in a picture and use a bar model. **Year 1** 5 x 5 = 25 	**Year 1 into Year 2** 3 + 3 + 3 + 3 + 3 = 15 5 groups of 3 is 15 Children to write a number sentence to describe objects. Children will practice frequent counting in multiples, forwards and backwards.
Counting in groups **Year 2 – counting in 2s, 5s and 10s** **Year 3 – counting in 3s, 4s and 8s** **Year 4 – counting in6s, 9s, 7s, 11s and 12s**	Children to use a number line or number track to count in repeated groups. **Year 1 into Year 2** 	Children to represent this pictorially by drawing Base 10/numicon alongside a number line. **Year 1 into Year 2** 	

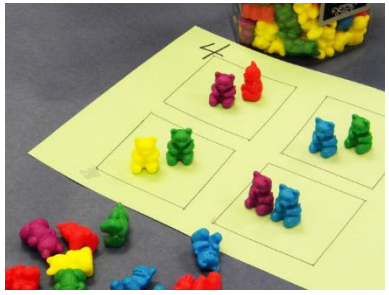
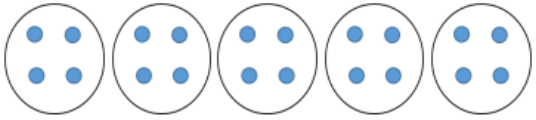
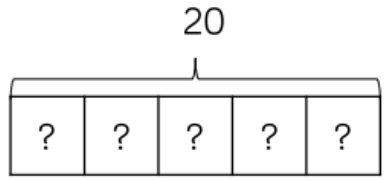
	Concrete	Pictorial	Abstract
Use arrays	Children to use counters and other objects to make arrays to illustrate the commutativity of multiplication. **Year 1 into Year 2** 3 groups of 4 = 12 4 groups of 3 = 12 	Children to represent their arrays pictorially. **Year 1 into Year 2** 	Children to use arrays to derive a family of related multiplication (and division) facts. **Year 2** 5 x 2 = 10 2 x 5 = 10 10 = 5 + 5 10 = 2 + 2 + 2 + 2 + 2
Multiply by partitioning	Children to use Base 10, numicon or place value counters to multiply the ones and tens separately. **Year 2** 	Children to represent the manipulatives they have used pictorially. **Year 2** 	Children to show the steps they have taken. **Year 3** This method is most efficient up to 3 digit x 1 digit, after which column multiplication is encouraged. 48 x 3 40 x 3 = 120 8 x 3 = 24 120 + 24 = 144

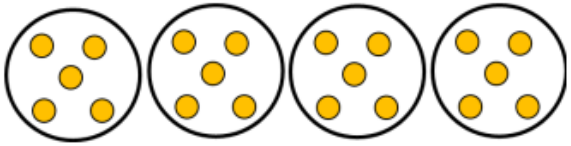
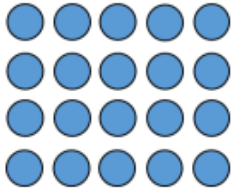
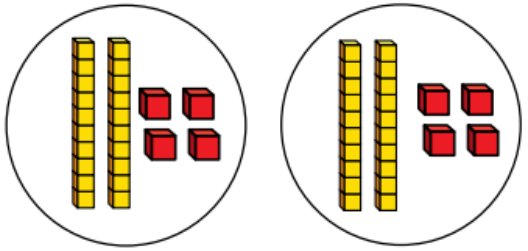
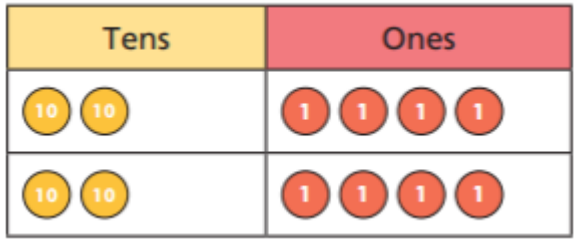
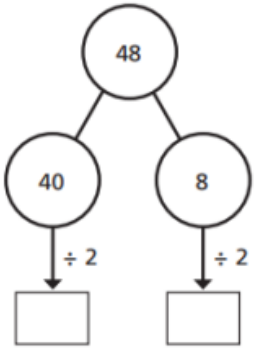
	Concrete	Pictorial	Abstract
Column multiplication (no exchanging)	**Year 3** Children to use Base 10 or place value counters to multiply.  43 x 2	**Year 3** Children to represent the Base 10 or counters pictorially.  21 x 3	**Year 3** Children to record their working using the formal column method. 
Column multiplication (with exchanging)	**Year 3** Children to use Base 10 or place value counters to multiply, physically exchanging when the total of a column is greater than 9. 34 x 5  	**Year 3 into Year 4** Children to represent the counters/Base 10 pictorially, showing where an exchange has been made. 24 x 3  	**Year 3 into Year 4** Children to use the formal written method, first in expanded form then leading to exchanging and holding more mentally.  

			Alternative method: grid method 24 x 15 = 360 X | 10 | 5 20 | 200 | 100 4 | 40 | 20

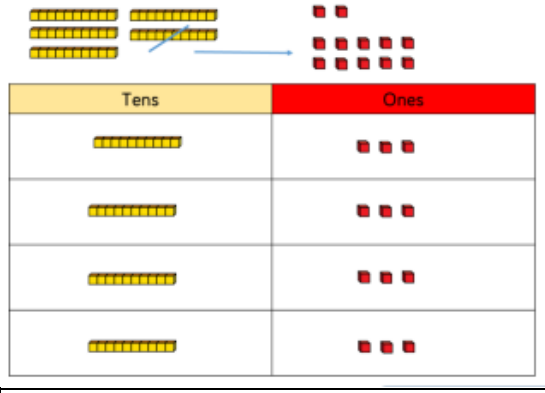
Calculation policy: Division

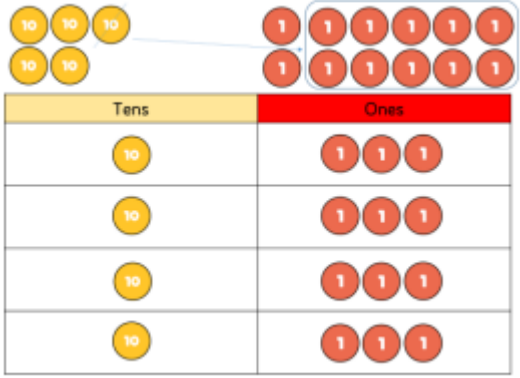
Key language: share equally, group, divide, divided by, half, quarter, remainder.

	Concrete	Pictorial	Abstract
Sharing into equal groups	**Year 1 into Year 2** Children to use a range of objects to share into equal groups. 	**Year 1 into Year 2** Children to represent the sharing pictorially by drawing counters/cubes/etc in equal groups.  20 ÷ 5 = 4	**Year 2** Children to use times table facts to divide. This process can also be represented in a bar model. 

	Concrete	Pictorial	Abstract
Grouping equally	**Year 1 into Year 2** Children to sort objects into equal groups and count the number of groups. 	**Year 1 into Year 2** Children to represent the grouping pictorially by drawing counters/cubes/etc in equal groups.   $20 \div 5 = 4$	**Year 2** Children to count in multiples to solve division calculations. For example, how many groups of 5 to get to 20? 5, 10, 15, 20. 4 groups of 5. So 20 divided by 5 = 4
Short division (2, 3 and 4 digits divided by 1 digit) - **no exchanging**	**Year 3 into Year 4** Children to use place value counters and Base 10 to divide, first dividing the column of the largest value and working down. 	**Year 3 into Year 4** Children to draw the manipulatives used to divide.  	**Year 3 into Year 4** Children to write calculations and represent their working in a part-whole model. $48 \div 2 = 24$ 

<table>
<tr><th></th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Short division (2, 3 and 4 digits divided by 1 digit)
- with exchanging</td>
<td>Year 3 into Year 4

Children to use place value counters and Base 10 to exchange one ten for ten ones, etc.
This supports links with the formal written method of division later.
 
</td>
<td>Year 3 into Year 4

Children to represent the division pictorially, showing where an exchange has been made.
 
</td>
<td>Year 5 into Year 6

Children to use short division method.

Begin with divisions that divide equally with no remainder.
Move onto divisions with a remainder.
Then encourage children to convert remainders into fractions of the divisor.
 
</td>
</tr>
<tr>
<td>Long division</td>
<td colspan="3">Year 6

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less efficient.

Children can write out multiples to help with calculations with larger 2-digit divisors.

372 ÷ 15 = 24 r12

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150</td>
</tr>
</table>