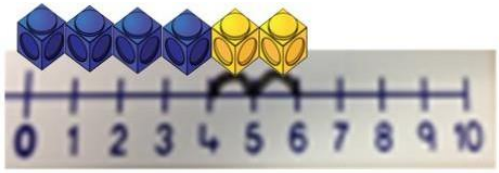
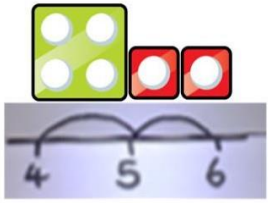
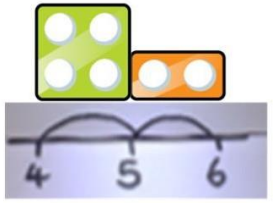
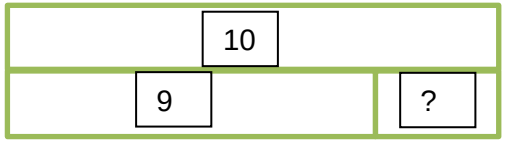
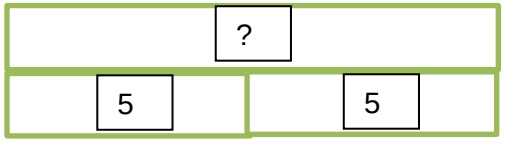
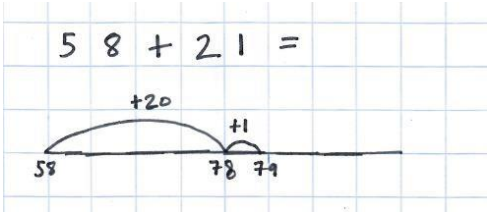
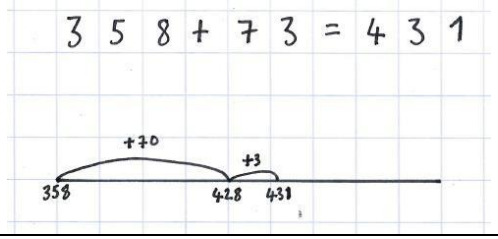
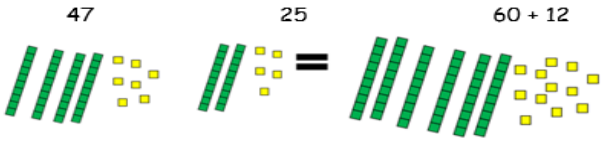
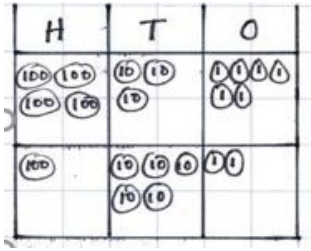
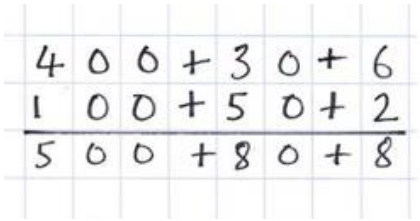
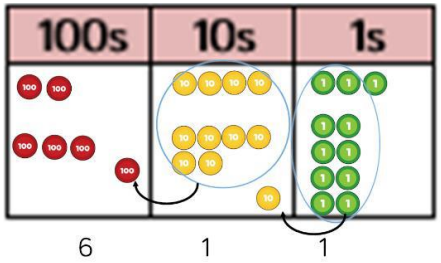
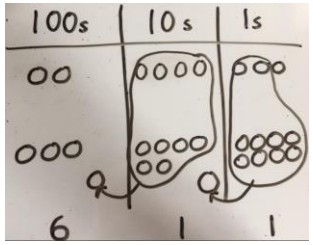
Calculation policy: Addition

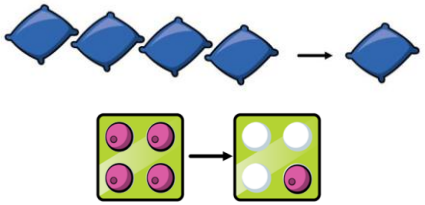
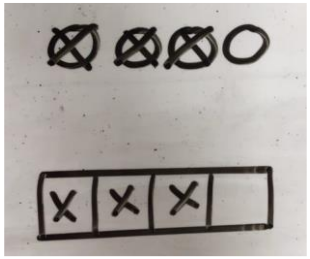
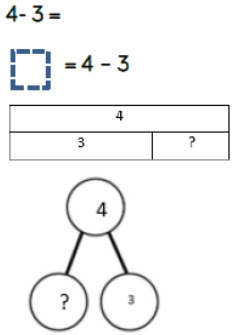
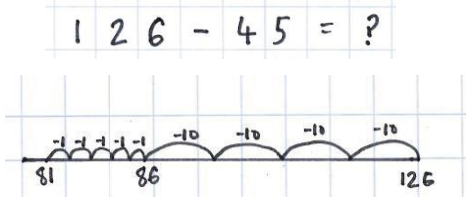
Key language: sum, total, parts and wholes, plus, add, altogether, more, ‘is equal to’ ‘is the same as’.

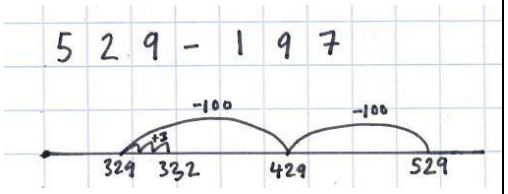
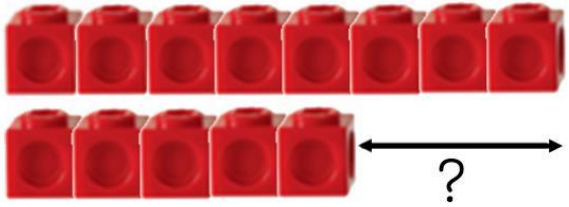
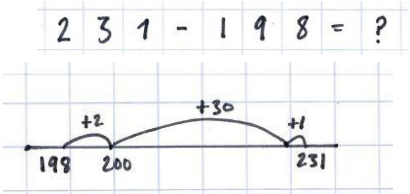
Concrete	Pictorial	Abstract
<u>Counting on using number lines</u> **Using cubes or Numicon to support.**    	**A bar model which encourages the children to count on, rather than count all.**   	TO + TO (up to 100)  • HTO + TO (through 100) 

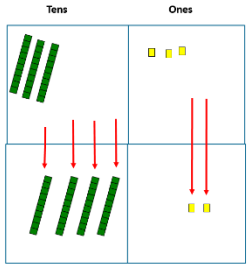
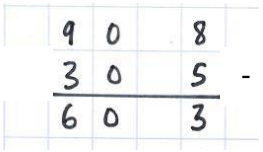
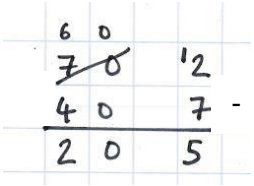
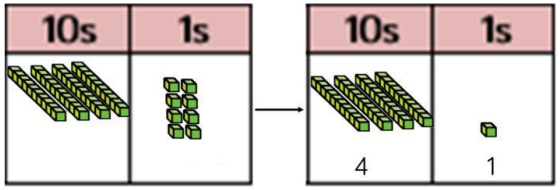
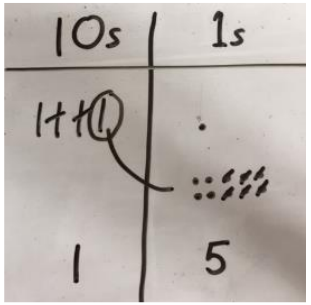
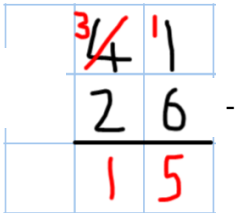
Expanded Column Method **Introduction to the column method through partitioning. This should be introduced alongside the concrete or pictorial representation.** 	**A place value grid or Dienes can be used to support the understanding of the expanded method of addition.** 	
Formal Written Method **Use of place value counters to add HTO + TO, HTO + HTO etc. 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.** 	**Children to represent the counters in a place value chart, circling when they make an exchange.** 	**Teachers may want to include H, T and O at the top of columns to support. The exchanging should be recorded below the equals sign.**

Calculation policy: Subtraction

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

Concrete	Pictorial	Abstract
<u>Physically taking away and removing objects from a whole</u> **(Ten frames, Numicon, cubes and other items such as beanbags could be used).** 		
<u>Counting back using number lines (or number tracks)</u>		**The jumps are recorded above the representation. Subtracting in tens before moving onto ones.** 

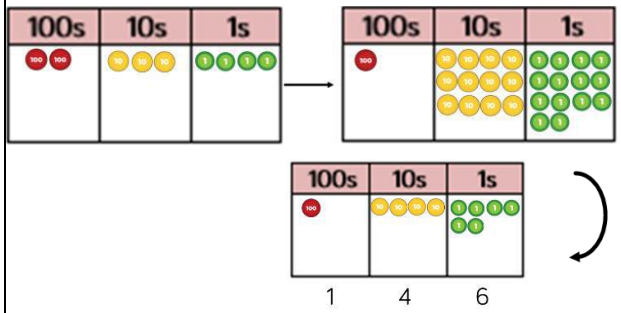
		This example shows counting back in 100s and then adding ones (to compensate). 
<u>Finding the difference</u> **(Using cubes, Numicon or Cuisenaire rods, other objects can also be used – Number lines to count on can help show the difference).** 	**Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.**	**This method involves working out the difference between two numbers by counting on. The first jump should be to the next multiple of ten followed by counting in multiples of ten before adding any remaining ones.** 

Expanded Column Method	 70 5 40 2 30 3	**This is recorded alongside in a vertical, expanded equation.**  
Column method **(Using base 10).** 48-7 	**Represent the base 10 pictorially, remembering to show the exchange.** 	**Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.** 

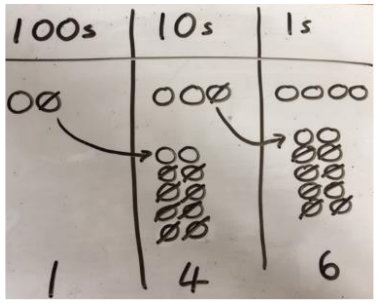
Formal Column method

(using place value counters)

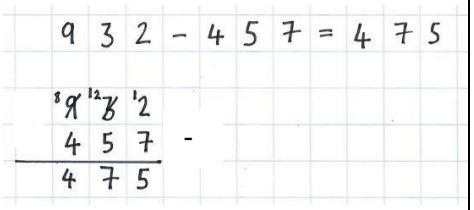
234 – 88

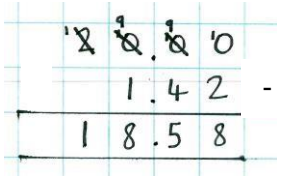


Represent the place value counters pictorially; remembering to show what has been exchanged.



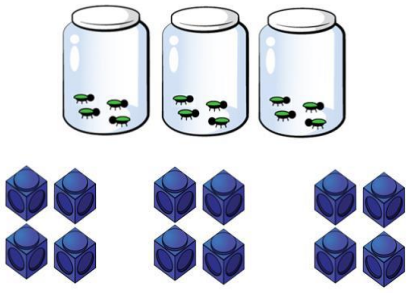
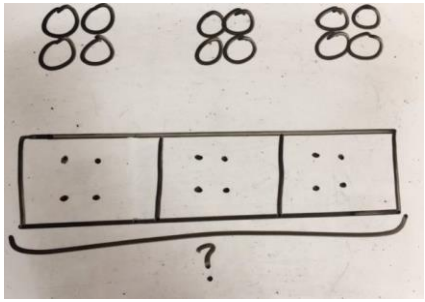
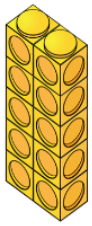
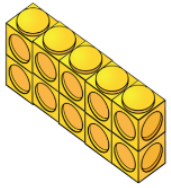
Formal column method. Children <u>must understand what has happened when they have crossed out digits.</u>

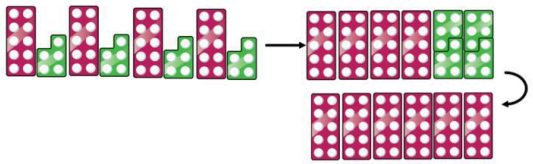
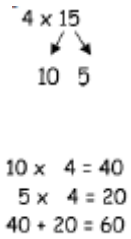
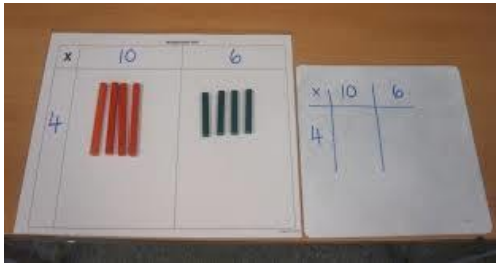
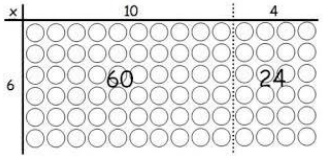
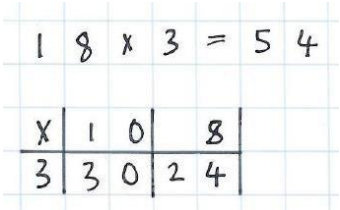
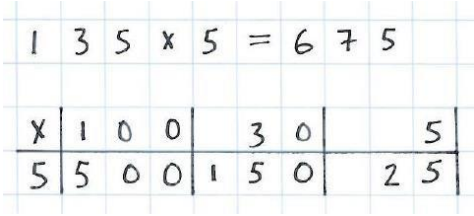




Calculation policy: Multiplication

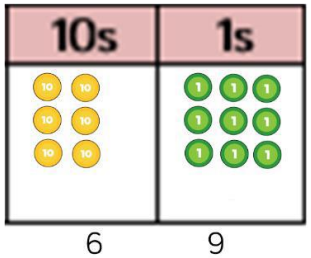
Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Concrete	Pictorial	Abstract
Repeated grouping/repeated addition **3 × 4** **4 + 4 + 4** **There are 3 equal groups, with 4 in each group.** 	**Children to represent the practical resources in a picture and use a bar model.** 	3 × 4 = 12 4 + 4 + 4 = 12
Use arrays to illustrate commutativity **(Counters and other objects can also be used.)**  2 lots of 5  5 lots of 2	**Children to represent the arrays pictorially.**  4 × 2 = 8 2 × 4 = 8  2 × 4 = 8 4 × 2 = 8	**Children to be able to use an array to write a range of calculations (number sentences) e.g.** **10 = 2 × 5** **5 × 2 = 10** **2 + 2 + 2 + 2 + 2 = 10** **10 = 5 + 5**

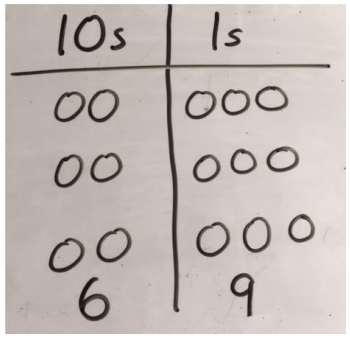
<u>Partition to multiply</u> **(using Numicon, base 10)** **4 × 15 =** 	**Children to represent the concrete manipulatives pictorially.**	**Children to be encouraged to show the steps they have taken.** 
<u>Grid method to multiply</u> **The two digit number is partitioned horizontally with the tens digit coming first. This time the equation is represented using place value counters or Base 10.** 	**Children to represent the concrete manipulatives pictorially.** 	  **This method can be used alongside column multiplication**

Formal column method with place value counters (short method)

(TO X O) (HTU X O) (TH,H,T,0 X 0)
(Base 10 can also be used.)
3 × 23



Children to represent the counters pictorially.



Children to record what it is they are doing to show understanding.

3 × 23

3 × 20 = 60

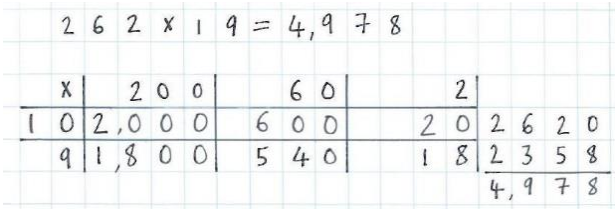
3 × 3 = 9

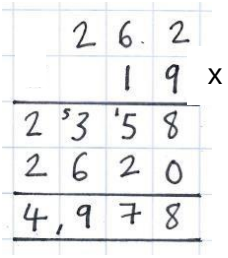
60 + 9 = 69

$$\begin{array}{r} 23 \\ 3 \\ \hline 69 \end{array} \times$$

Long multiplication (HTO X TO)

Multiplying a two digit number by a three digit number should be introduced through the grid method before moving to long multiplication to aid understanding.

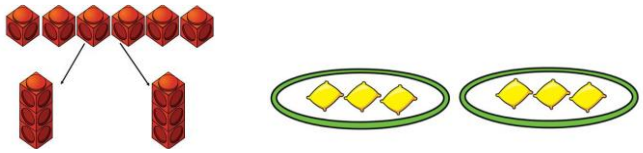
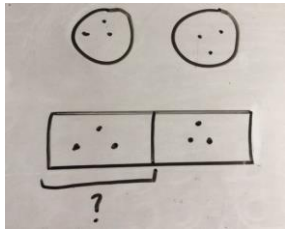
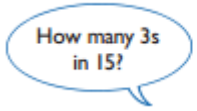
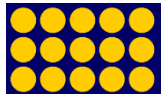
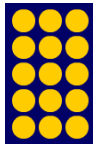
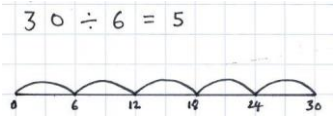
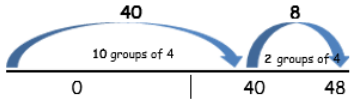
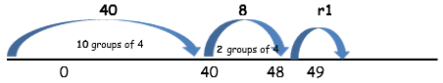




		In Upper Key Stage 2, children will be shown how to use the 'Coin Fact' method for multiplication and division: **1x12=12 (find this first)** **2x12=24 (double the answer above)** **5x12=60 (now half the 10x)** **10x12=120 (times the first by 10)** **20x12=240 (double the 10x)** **50x12=600 (half the 100 times)** **100x12=1200 (times the 10x by 10)**

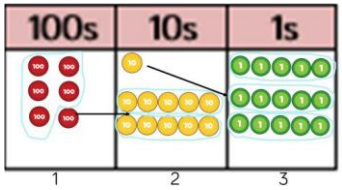
Calculation policy: Division

Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
<u>Sharing</u> **(Using a range of objects.)** **6 ÷ 2** 	**Represent the sharing pictorially.** 	6 ÷ 2 = 3 3 | 3 **When sharing, children should be encouraged to use their chosen times tables**
<u>Grouping (with use of a number line)</u> **Children should apply their counting skills to develop some understanding of grouping.**   15 ÷ 3 = 5	**Use of arrays as a pictorial representation for division.** **15 ÷ 3 = 5 There are 5 groups of 3.** **15 ÷ 5 = 3 There are 3 groups of 5.**   **<u>Grouping using a number line</u>** **Group from zero in jumps of the divisor to find out 'how many groups of 6 are there in 30?'** 	**Abstract number line to represent '<u>Efficient Grouping</u>'. The equal groups that have been subtracted.** 48 ÷ 4 = 12  **Children need to be able to partition the dividend in different ways.** **Answers with remainders:** 49 ÷ 4 = 12 r1 

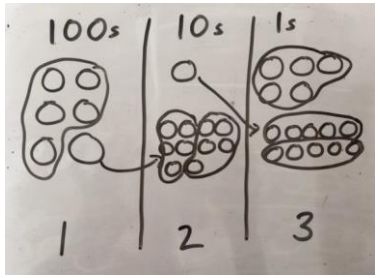
Short division

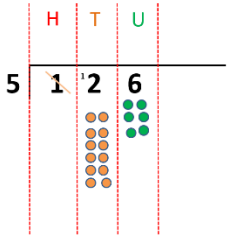
Using place value counters to group.
615 ÷ 5



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the place value counters pictorially.





Children to the calculation using the short division scaffold.

$$\begin{array}{r} 123 \\ 5\overline{)\,6^{1}1^{1}5} \end{array}$$

$$\begin{array}{r} 24 \\ 4\overline{)\,9\ 6} \end{array}$$

Long division (with chunking)

If children are taught how to efficiently group they will see the link to chunking

HTO ÷ TO (without remainders)

432 ÷ 16 = 27

$$\begin{array}{rl} & 27 \\ 16 & \overline{)\,{}^{3}\cancel{4}\,{}^{1}3\ 2} \\ - & 160 \quad (10 \times 16) \\ & 272 \\ - & 160 \quad (10 \times 16) \\ & {}^{0}\cancel{2}\,{}^{1}1\ 2 \\ - & 80 \quad (5 \times 16) \\ & 32 \\ - & 32 \quad (2 \times 16) \\ & 00 \end{array}$$

HTO ÷ TO (with remainders)

327 ÷ 19

$$\begin{array}{rl} & 17 \text{ r } 4 \\ 19 & \overline{)\,{}^{2}\cancel{3}\,{}^{1}2\ 7} \\ - & 190 \quad (10 \times 19) \\ & {}^{0}\cancel{2}\,{}^{1}3\ 7 \\ - & 95 \quad (5 \times 19) \\ & {}^{3}\cancel{4}\,{}^{1}2 \\ & 38 \quad (2 \times 19) \\ & 04 \end{array}$$