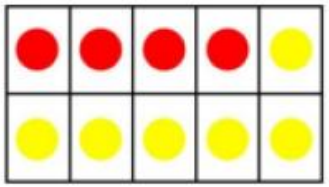
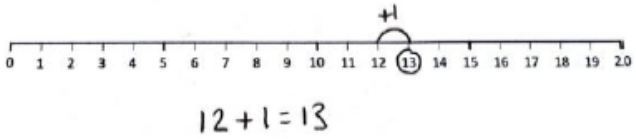
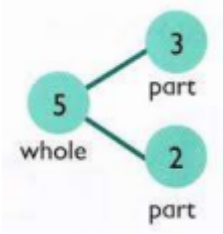
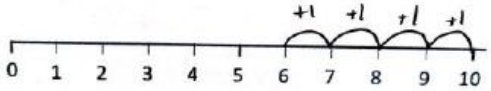
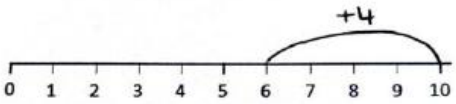
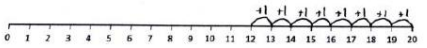
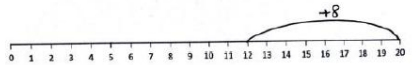
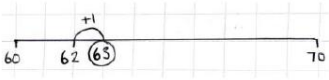
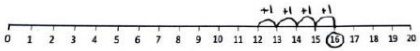
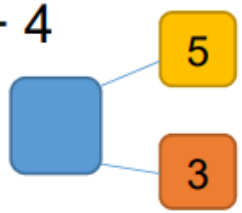
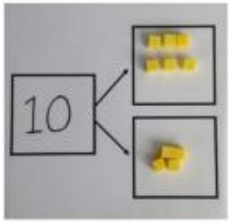
The Schools of Woolton Hill Calculation Policy

Calculation Policy:

- Long term progression in calculations over the four operations: Addition, Subtraction, Multiplication and Division.

- This shows the methodology and equipment to be used at each stage, but does not act as a long-term plan. Please continue to use current planning documents and The National Curriculum for precise information on what children need to be taught.

Addition	Concrete	Pictorial	Abstract
Year 1	Use Tens Frames to represent number bonds, Represent number bonds within 10. 4 + 6 = 10  Find 1 more of a given number within 20 using a Number Line or Number Track. Find 1 more from any given number within 20.  12 + 1 = 13	Use the Part-Whole model and Bar Models to represent addition relationships.   Using Number Lines to show Number Bonds and simple addition calculations. Use number bonds within 10.  6 + 4 = 10  6 + 4 = 10	Represent and use number bonds within 20.  12 + 8 = 20  12 + 8 = 20 Find 1 more from any given number within 100.  Add 1-digit and 2-digit numbers to 20.  12 + 4 = 16 4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.



Use cubes to add two numbers together as a group or in a bar.

Alternate objects may also be substituted instead of cubes to ensure mathematical understanding does not rely on a single practical representation.

Using Cuisenaire rods to identify number bond relationships to 10

Figure 5

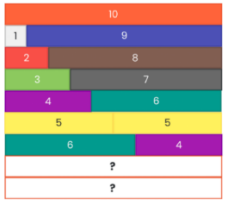
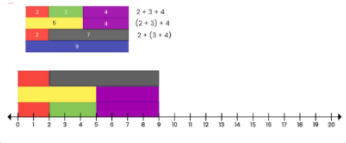
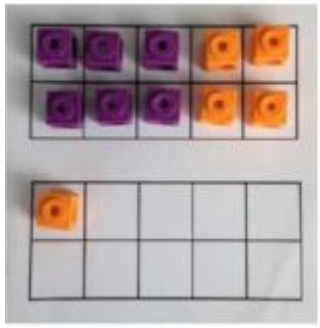
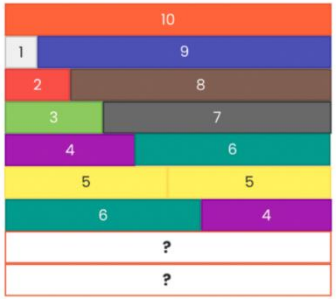
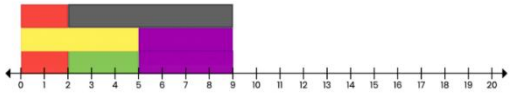
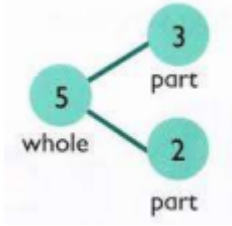
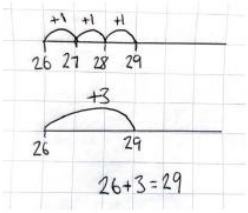
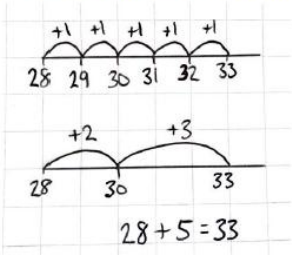
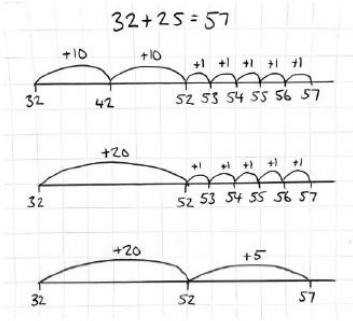
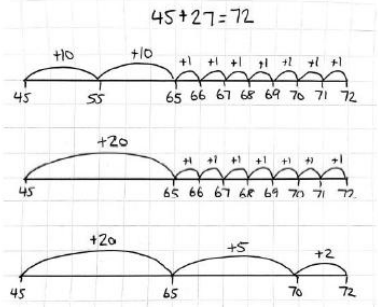
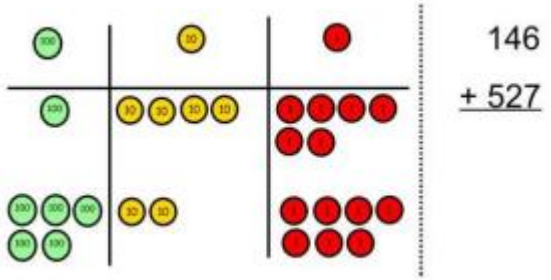
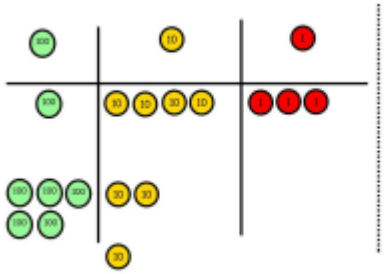
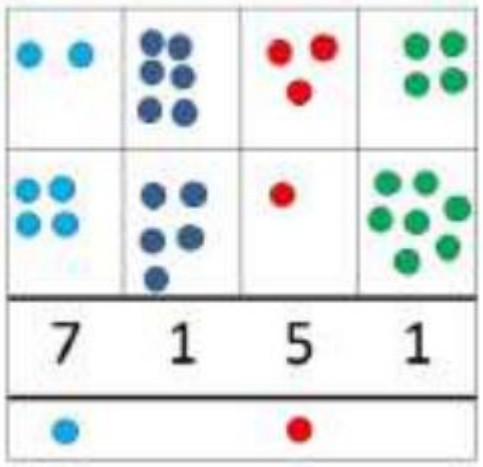
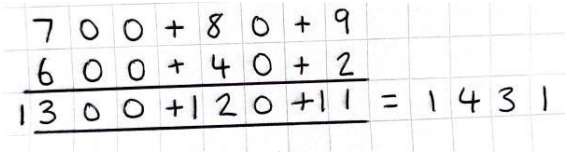
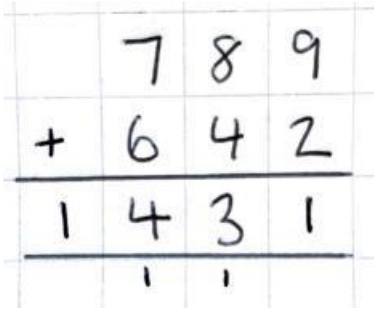
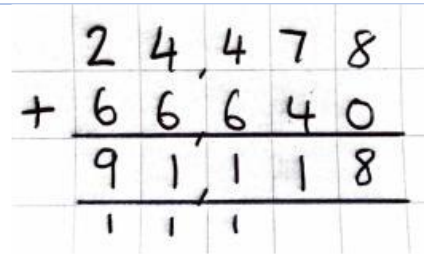


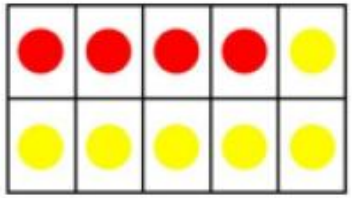
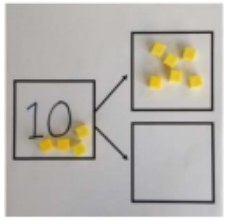
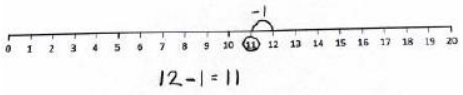
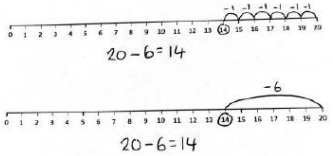
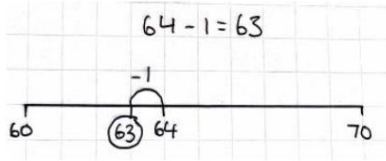
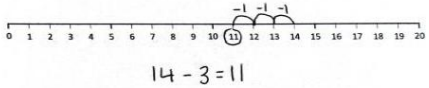
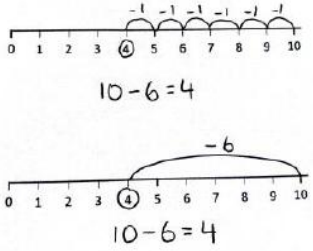
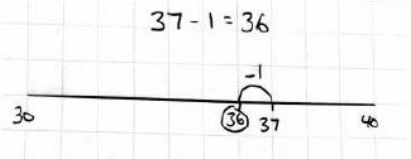
Figure 6



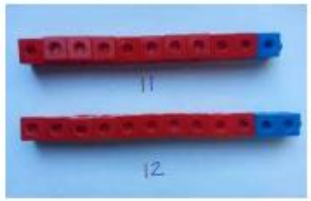
Year 2	Using Tens frames to practically find the relationship between number bonds to 10 and 20. 6 + 5 = 11  Numicon Tens frame Start with the bigger number and use the smaller number to make 10. Use Cuisenaire Rods to identify relationships of number between number bonds to 10 and 20. Figure 5  Figure 6  	Use the Part-Part-Whole Model and Bar model to represent Addition calculations.   Using Number Lines to show addition calculations. Add 2-digit numbers and ones to 50 without bridging.  Add 2-digit numbers and ones to 50 with bridging.  	Adding two 2-digit numbers without bridging.  Adding two 2-digit numbers with bridging. 

Year 3 – 6 Column Method – Regrouping Y3 – up to 3 digits. Y4 – up to 4 digits. Y5 – more than 4 digits. Y6 – Decimals with different amounts of numbers after the decimal point.	Make both numbers on a place value grid.  146 + 527 Add up the units and regroup 10 ones for one 10.  146 + 527 Add up the rest of the columns, regrouping the 10 counters from one column for the next place value column until every column has been added. This can also be done utilising Place Value Deinnes to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100 etc. As children move on to decimals, money and decimal place value counters can be used to support learning.	Children draw a pictorial representation of the columns and place value counters to further support their learning and understanding.  Can also be done using Deinnes. Drawing Deinnes in Year 3 and 4.	Expanded form to develop understanding and reasoning. Especially when using increasingly larger numbers. Important to use in Year 3 to link understanding between Place Value knowledge and addition. Start by partitioning the numbers before moving on to clearly show the regroup below the addition. This is the expanded form:  

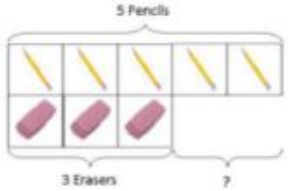
			 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used as real-life context here.

Subtraction	Concrete	Pictorial	Abstract
Year 1	Use physical objects, counters, cubes etc to show how objects can be taken away.  6 – 2 = 4 4 – 2 = 2   Represent number bonds within 10. 10 – 6 = 4 	 Link to addition- use the part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? Find 1 less from any given number within 20.  	Represent and use number bonds within 20.  Find 1 less from any given number within 100.  Subtract 1-digit and 2-digit numbers within 20.  Use number bonds within 10.  Find 1 less from any given number within 50. 

Compare amounts and objects to find the difference.



Use cubes to build towers or make bars to find the difference



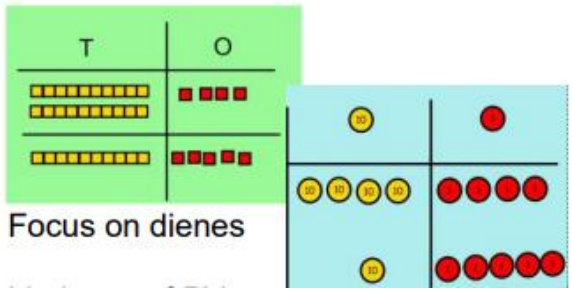
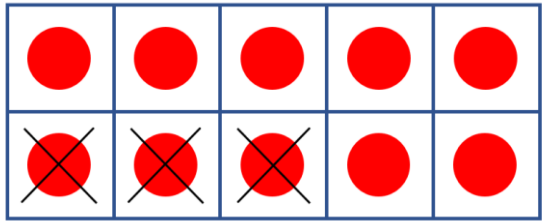
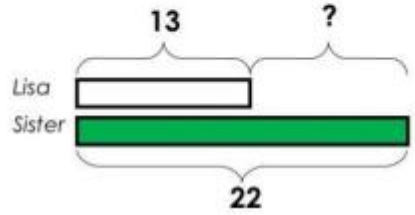
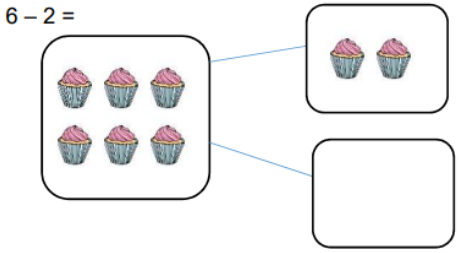
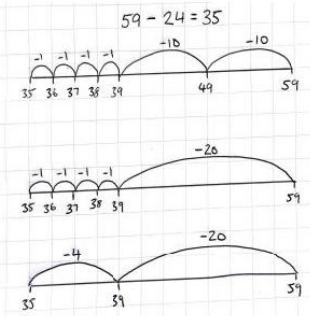
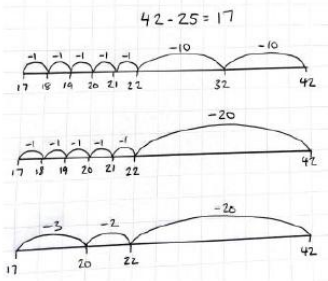
Use basic bar models with items to find the difference

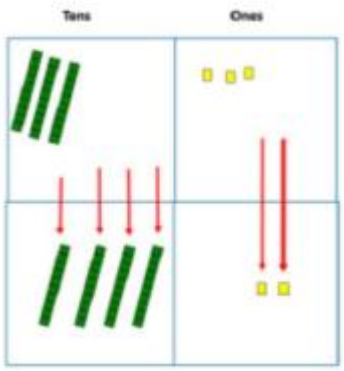
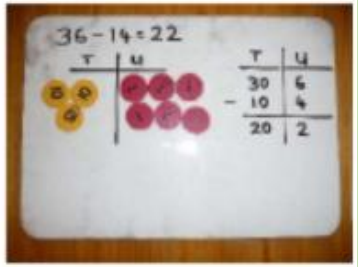
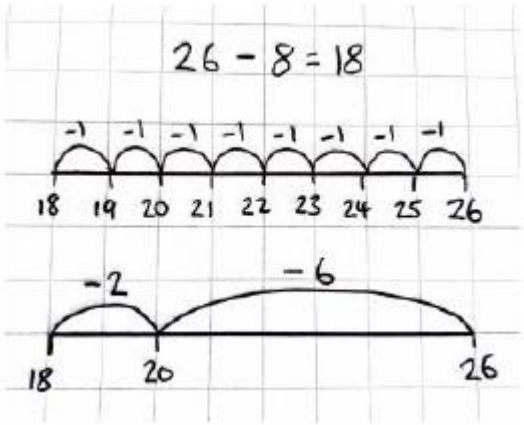
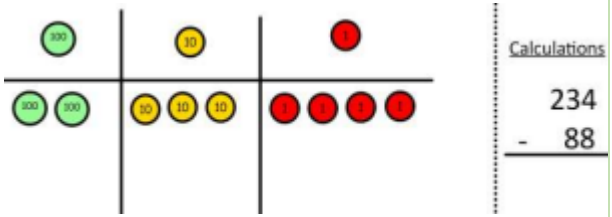
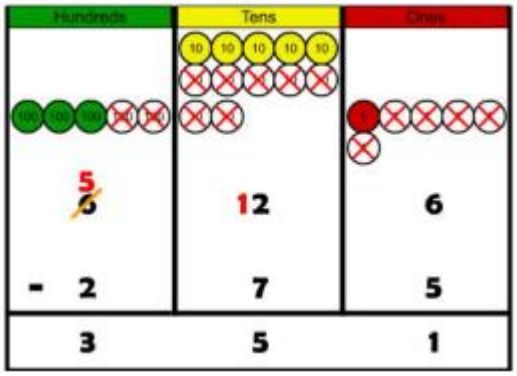
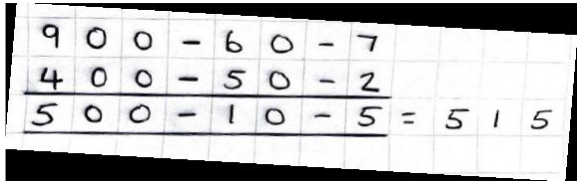
10 - 6 =

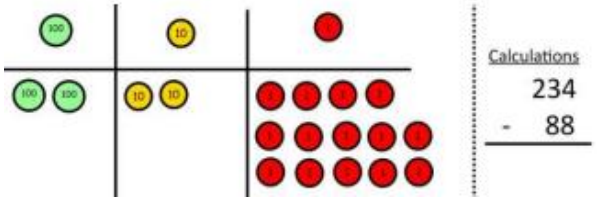
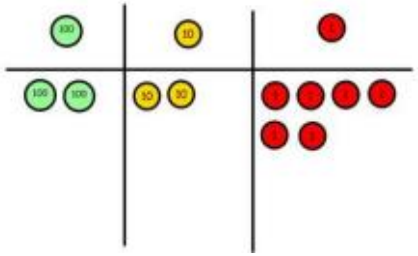
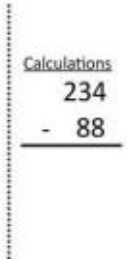
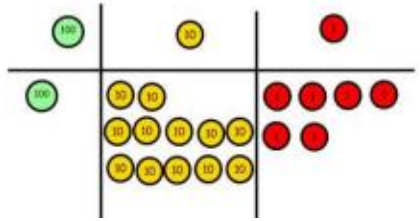
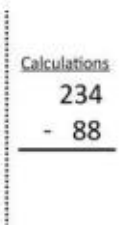
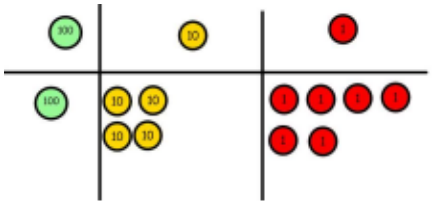
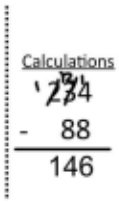
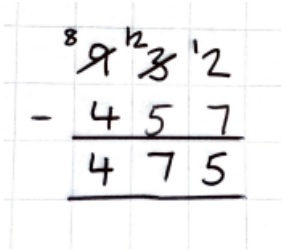
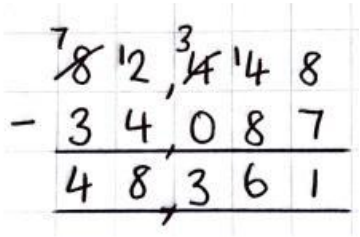
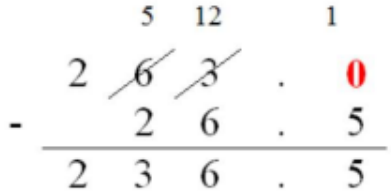
Cuisenaire to represent fact families.

7 - 4 = 3

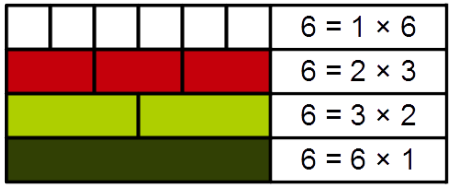
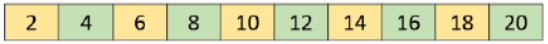
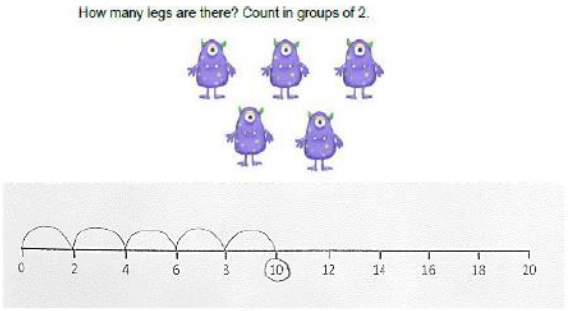
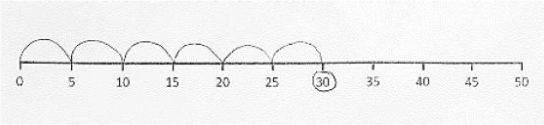
Add together the ones first then add the tens. Use the Dienes first before moving onto

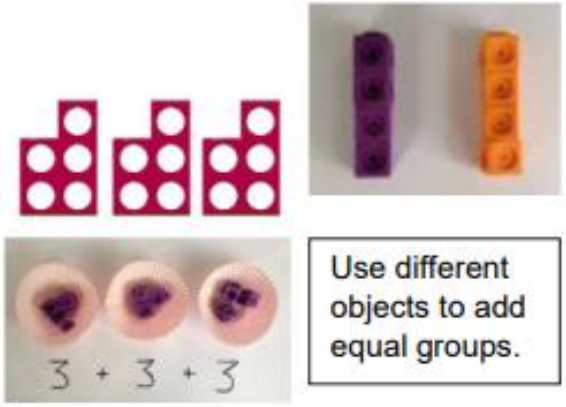
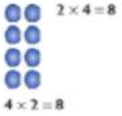
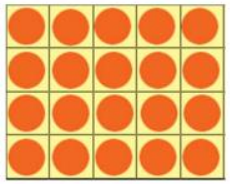
	Place Value Counters.  		
Year 2	Using Tens Frames to subtract practically.  Use Deines to make the larger number then take the smaller value away.	**Comparison Bar Models** *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  Using Bar models to compare number – linking back to use of Cuisenaire rods. Use a pictorial representation of objects to show the part part whole model. 6 – 2 = 	Subtract two 2-digit numbers without bridging.  Subtract two 2-digit numbers with bridging. 

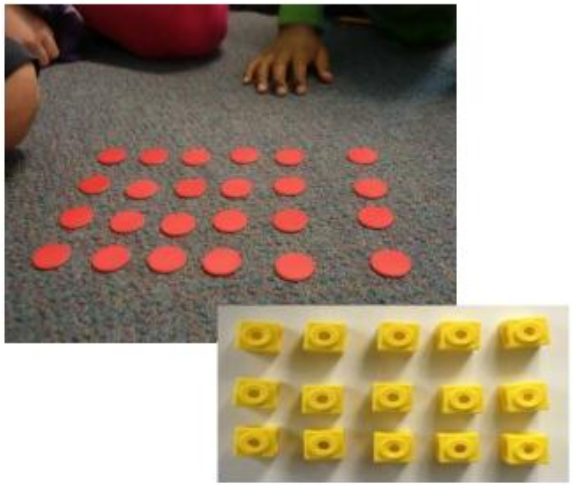
	 Show how you partition numbers to subtract. Again make the larger number first. 	Using Number lines to subtract ones and tens from a given number up to 100. 	
Year 3 - 6 Column method with regrouping Y3 – up to 3 digits Y4 – up to 4 digits Y5 – more than 4 digits. Y6 – decimals with various	Use Deinnes and Place Value counters. Start with one regroup before moving onto subtraction calculations with more than one regroup. make the larger number with place value counters.  Start with the ones, can I take away 8 from 4 easily? I may need to regroup one of my tens	Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the regroups you make. 	Expanded Subtraction to be done in Y3. Then use expanded and compact method side by side.  Children can start their formal written method by partitioning the number into clear place value columns. Moving forward the children use a more compact method. This will lead to an

amounts of decimal places.	for ten ones.  Calculations 234 - 88 Now I can subtract my ones.   Calculations 234 - 88 Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.   Calculations 234 - 88 Now I can take away eight tens and complete my subtraction.   Calculations 234 - 88 146		understanding of subtracting any number including decimals.   Y5 – same number of decimal places.  Y6 – with different numbers of decimal places.

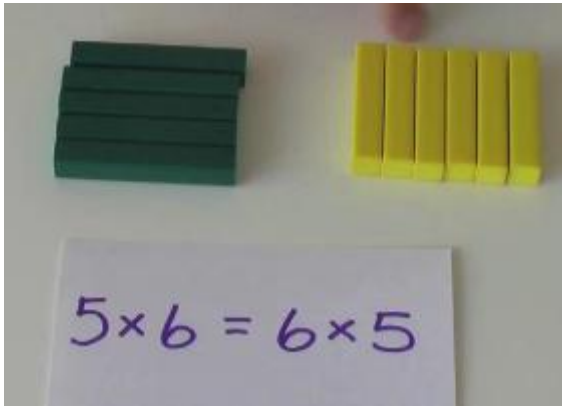
	Show children how the concrete method links to the written method alongside your working. Cross out the numbers when regrouping and show where we write our new amount.		

Multiplication	Concrete	Pictorial	Abstract
Year 1	Use Cuisenaire Rods to count in groups.   Count in multiples supported by concrete objects in equal groups. Number Tracks **Count in multiples of twos** Number track  	Use Bar Models to represent equal parts making a whole.  Whole = Part × Number of Parts Part = Whole ÷ Number of Parts Number of Parts = Whole ÷ Part **Solve one step multiplication, by calculating the answer using pictorial representations (twos)** Structured number line, e.g:  	Count in multiples of a number aloud. Write number sequences with multiples of numbers for 2s, 5,s and 10s. 2, 4, 6, 8, 10 5 , 10, 15, 20 , 25, 30 

	Count in multiples of tens Number track 10 20 30 40 50 60 70 80 90 100 **Count in multiples of fives** Number track 5 10 15 20 25 30 35 40 45 50		
Year 2	Grouping objects and counting groups.  Create arrays using Tens Frames and counters to show multiplication sentences.	Draw arrays in different rotations to find **commutative** multiplication sentences.    Link arrays to area of rectangles.  Use Bar models to represent repeated addition and its look to multiplication. **5 + 5 + 5 + 5 = 20** **5 x 4 20**	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15



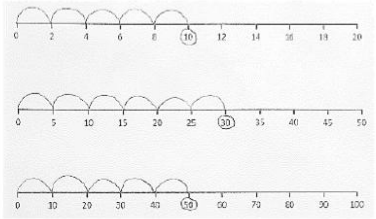
Cuisenaire Rods to show bar models practically.



Count in multiples of fives
Number track

5	10	15	20	25	30	35	40	45	50

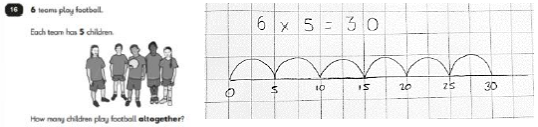
Count in steps of two, five from 0 and in tens from any number, forward and backward.
Structured number line.



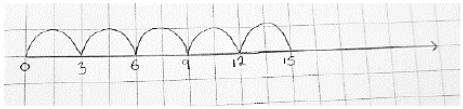
Count in steps of 3.
Number track

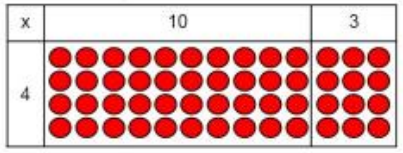
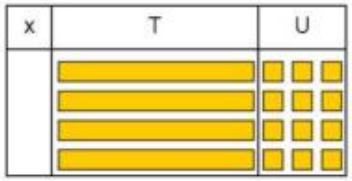
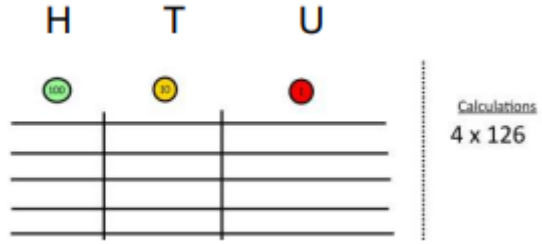
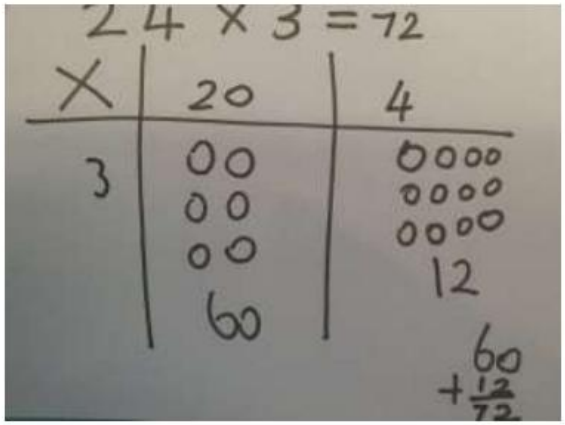
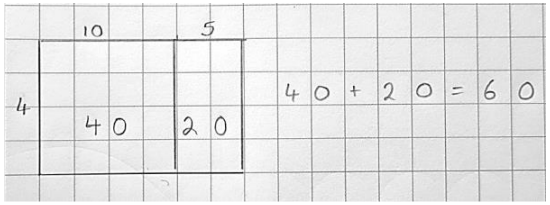
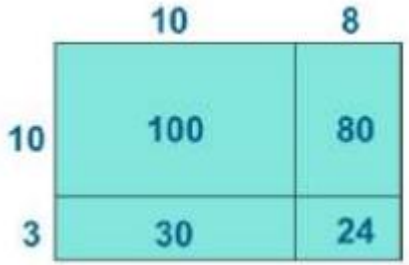
3	6	9	12	15	18	21	24	27	30

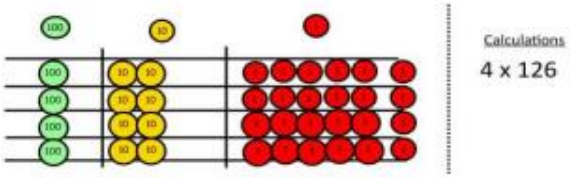
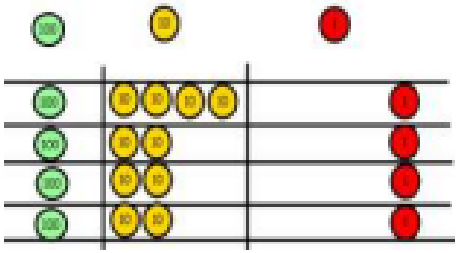
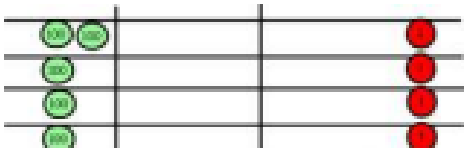
Recall and use multiplication facts for the 2, 5 and 10 multiplication tables.
Unstructured number line to 'prove it'

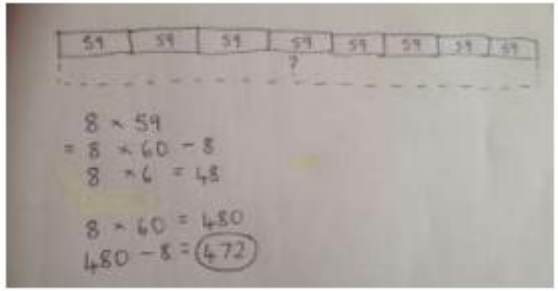
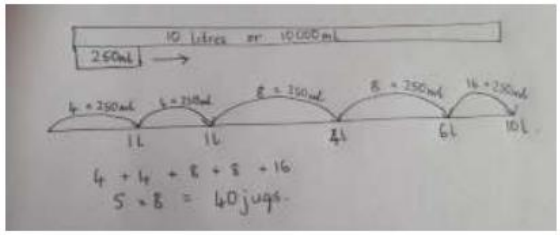
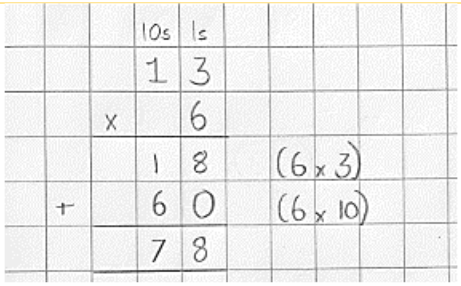
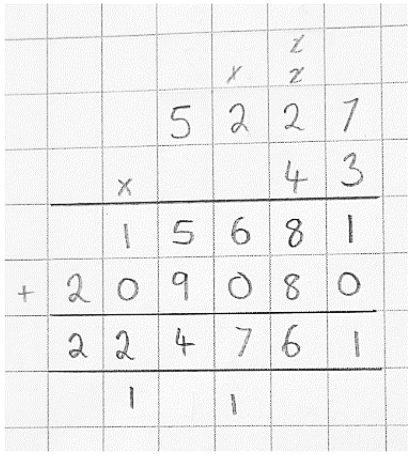


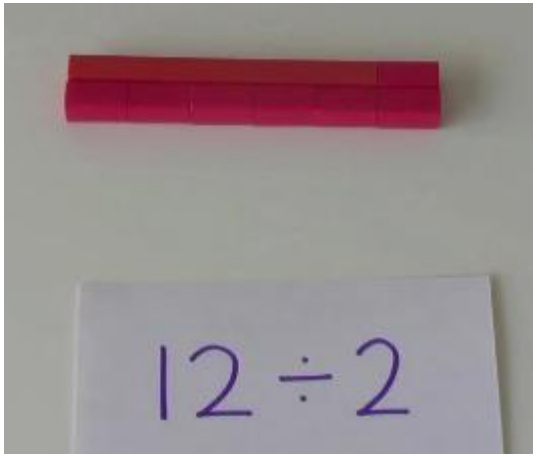
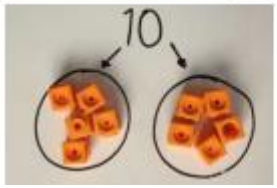
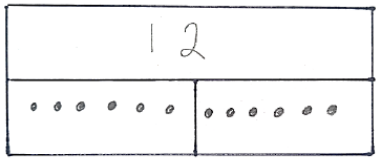
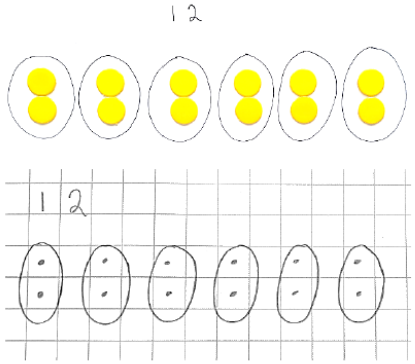
Count in steps of 3.
Unstructured number line

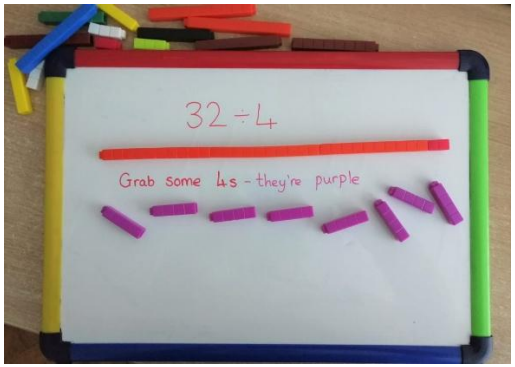
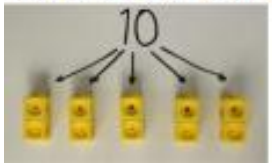
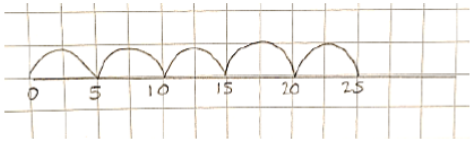
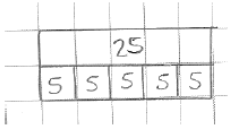
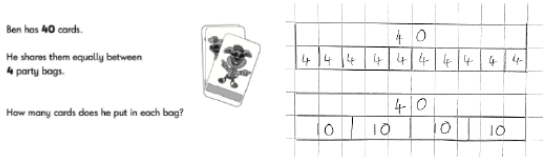
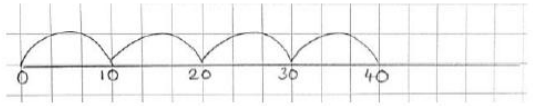
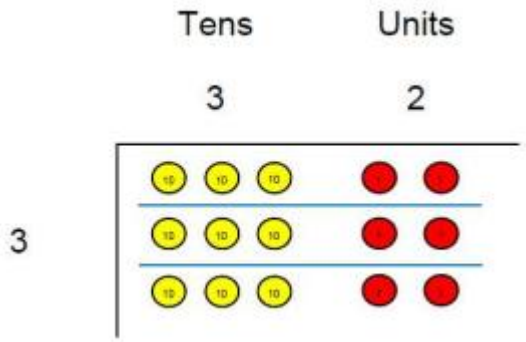
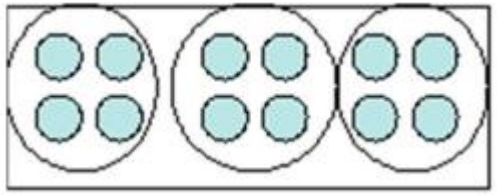
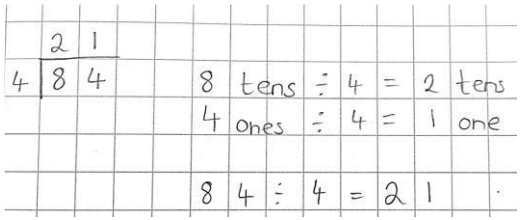


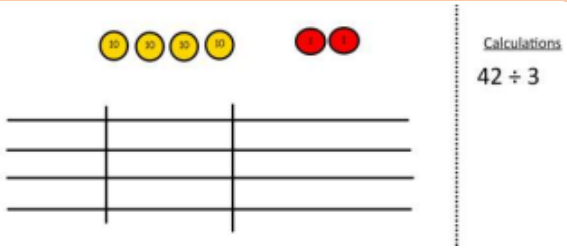
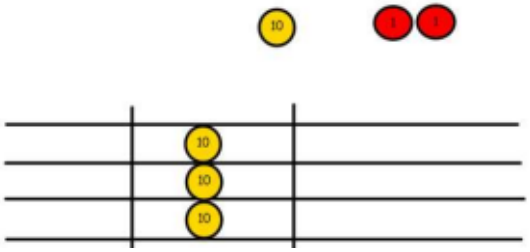
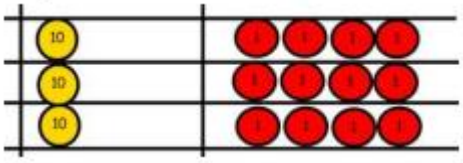
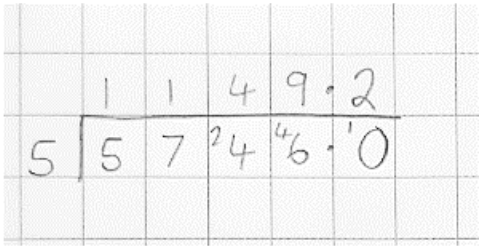
	Using Number Tracks to count multiples.		
Year 3 Grid Method	Show the link with arrays to first introduce the grid method with counters.  4 rows of 10 4 rows of 3 Move on to using Deinnes to move towards a more compact method.  4 rows of 13 Use Deinnes – then once secure, move onto place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.  Fill each row with 126.	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below. Also construct with Place Value counters before trying this.  	Start with multiplying by one-digit numbers and showing the clear addition alongside the grid.  Moving forward, multiply by a 2-digit number showing different rows within the grid method.  Once secure, move into column multiplication.

	 Add up to each column, starting with the ones making any exchanges needed.  Then you have the answer. 		
Year 4, 5 and 6 Column Multiplication Year 4 – two-digit and three-digit x by 1-digit.	Children can continue to be supported by Place Value counters at the stage of multiplication. Using Place Value counters and Deinnes. Children must know the grid method first and use this as a support before moving on. It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods. (Children need to understand multiplication as repeated addition to use bar modelling for problem solving.)	Y5 and 6 - Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer.

Year 5 – four-digit x by 1 or 2-digit numbers. Year 6 four-digit numbers x by 2 digit numbers including decimals.	below. Bar modelling can also use Cuisenaire.	  	 This moves to the compact method.  

Division	Concrete	Pictorial	Abstract
Year 1	Use Cuisenaire Rods to represent totals being shared into equal size values.  Grouping and sharing into equal groups using practical objects – counters – multi-link cubes. An understanding of what division is.  I have 10 cubes, can you share them equally in 2 groups?  	**Making equal groups (including finding half of a quantity).** Bar models, e.g: *I had 12 grapes and I ate half. How many are left?*  **Making equal groups – grouping.** Concrete objects and pictorial representations, e.g: *I have 12 cookies to put in bags.* *If I put 2 in each bag how many bags will I need?*  "There are **12** altogether. There are **6** equal groups of **2**."	Share 9 buns between three people. $9 \div 3 = 3$ There is no requirement for Year 1 children to record division calculation in an abstract manner so children will draw upon pictorial scaffolds to support their understanding at this stage.

Year 2	Use Cuisenaire Rods represent division number sentences.  Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	**Count on in steps of two, three and five from 0.** Skip counting on an unstructured number line, e.g: 25 ÷ 5 = □  25 ÷ 5 = 6 Bar model representation:  	**Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.** Number line or bar model to 'prove it'  "If I know that 4 x 10 = 40, then I know 40 ÷ 4 = 10".  28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?
Year 3 – 6 Y3 – Up to 2-digits divided by 1-digit. Y4 – Up to 3-digits divided by 1-digit. Y5 – Up to 4-digits by 1-digit (interpret remainders appropriately for	Use Place value counters to divide using the bus stop method alongside.  	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Only for SEN children. Not practical for higher numbers. As soon as understood, move onto abstract.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder. Finally move into decimal places to divide

context) Y6 – as above including dividing into decimals remainders to 3 decimal places.	 Start with the biggest place value digit, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We regroup this ten for ten ones and then share the ones equally among the groups.  To get the answer, we look at how much is in 1 group so the answer is 14.	Encourage them to move towards counting in multiples to divide more efficiently. Can draw P.V. counters here if need the pictorial step.	the total accurately. 

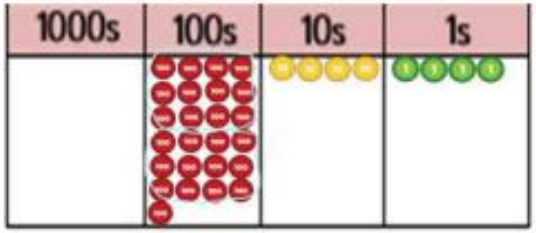
Year 6

Long Division
4-digit numbers divided by 2-digit numbers.

Long division using place value counters

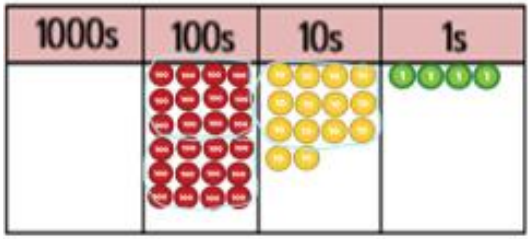
2544 ÷ 12

We can't group 2 thousands into groups of 12 so will exchange them.



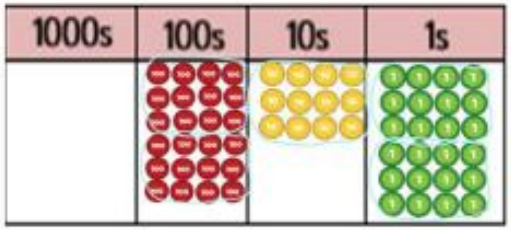
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$\begin{array}{r} 02 \\ 12\overline{)2544} \\ 24 \\ \hline 1 \end{array}$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$



After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$