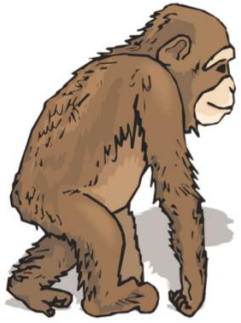
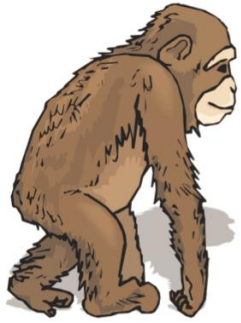
Teaching for Mastery in Mathematics at

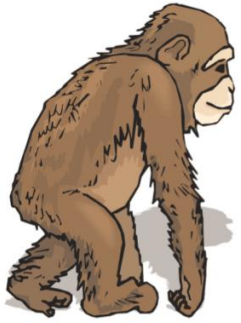
Calculation Policy



Answer



Prove it!



Explain it!

With acknowledgements to NCETM, Annette Durkin (Whitehill Primary School), Reigate Park Primary School & White Rose Maths HUBS.

What does this booklet include?
How Maths is taught at Cherry Tree Hill Primary School
Progression in the teaching of counting in FS
Progression in the teaching of place value
Progression in the teaching of calculations - Add it! - Subtract it! - Multiply it! - Divide it!
Progression in the teaching of Times Tables
Key questions around APE

HOW MATHS IS TAUGHT AT CHERRY TREE HILL PRIMARY

LESSON DESIGN - CURRICULUM EYFS

Within Early Years, maths is developed through purposeful, play based experiences and will be represented throughout the indoor and outdoor provision. Learning expectations begin with the mathematics programmes of study (from the Early Years Statutory Framework) and further developed through our Mathematics curriculum trees. Maths group times run throughout the year and gradually increase over the early years. Teachers then carry out interventions through provision to ensure that learning is embedded. As pupils progress through Nursery and Reception, children will be encouraged to record their mathematical thinking (through provision and Drawing Club) and this will increase throughout their time in their EYFS.

LESSON DESIGN - CURRICULUM YEARS 1 – 6

At Cherry Tree Hill Primary School, we have adapted the teaching for mastery in mathematics approach, where we believe that all children can do maths. Daily maths lessons are taught in KS1 and KS2 to whole class groups. Children are taught through a variety of concepts and procedures from the National Curriculum 2014, we aim to move children through the curriculum at broadly the same pace. Differentiation is achieved by taking small steps throughout the lesson to allow all children to access the learning, children are given interventions at the point of need to give them chance to consolidate their learning. Rapid graspers are continually challenged throughout the lesson to unsure they develop a deep level of understanding. The teaching part of the lesson entails children being involved. This is facilitated through the use of detailed slides. Lessons are interactive with paired talk as well as modelling through the use of concrete materials. Children can interact with the learning in a variety of ways. Some of these ways include: Maths Jotters, whiteboards, sugar paper, peer questioning and the use of manipulatives etc. Children are typically taught for 40-45 minutes and have 15 minutes to work independently on their task (unless a practical lesson is taking place).

INTERVENTIONS

Interventions take place daily and they are led by the teacher during assembly time. This takes place between the lesson input and the independent task. Formative assessments during the lesson input are gathered and any pupils who have not grasped the concept or who have misconceptions, have an intervention "at the point of need" to ensure that they can complete their independent task and are ready for the next step in the learning. A flight path (runway, take off, taken off) is used to collect children's names.

PLANNING

We use Maths No Problem which is fully aligned to the 2014 National Curriculum, as well as resources provided by the White Rose Maths Hub and the NCETM website. Teachers work in year groups to plan, resource and deliver lessons that suit the learning styles of the children within the year group at the age related expectation. Individual, paired and group work is used across a series of lessons. Each day, children are provided with a 'Thinking Time' task to extend their learning once the

independent task has been completed. Planning demonstrates the various challenges available to children as well as the mastery task and greater depth task. Questioning using the APE approach is included on the planning.

RESOURCES

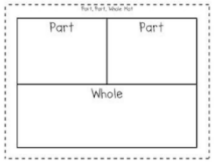
Within lessons, teachers utilise practical resources to ensure that concepts are represented to the pupils in order for them to gain depth of understanding. Children are progressively encouraged to select materials suitable for the task in which they are engaged. Teachers have been provided with a variety of resources that can support teachers with this planning. Some of these include: Maths No Problem textbooks and workbooks and Maths HUBs Schemes of Work. Teachers are strongly encouraged to use websites such as NCETM, NRich and Kangaroo Maths to aid their planning.

WORKING WALLS

Working walls are updated for each unit taught. Children's work as well as concrete, visual and abstract representations can be displayed to aid children's learning.

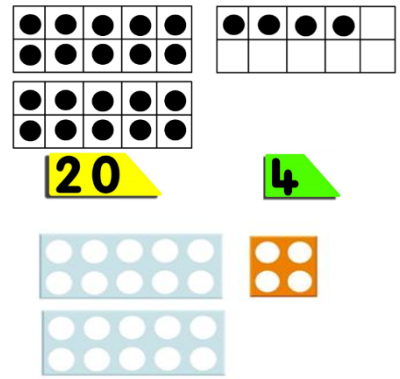
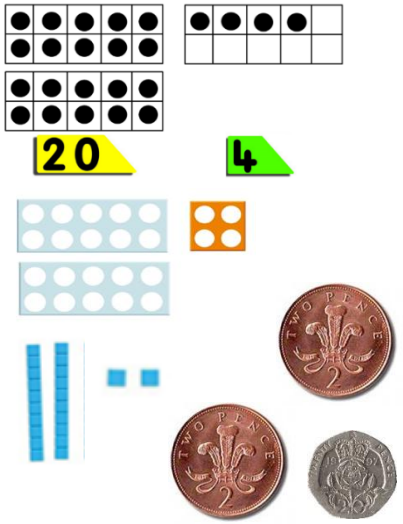
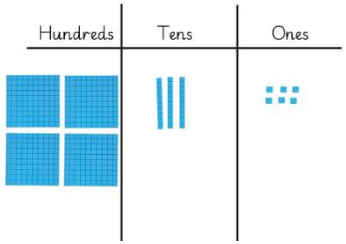
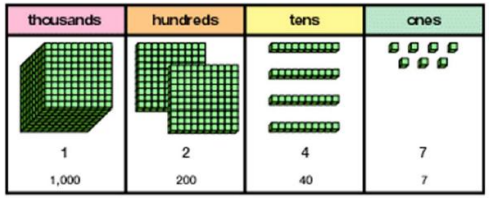
PROGRESSION IN THE TEACHING OF COUNTING IN THE EYFS

Pre Counting	One to One Correspondence	Cardinality (Knowing the final number counted is the total number of objects)	Conservation of numbers
The key focus in pre counting is an understanding of the concepts more, less and the same and an appreciation of how these are related. Children at this stage develop these concepts by comparison and no counting is involved.	The number word, numeral and representation has to be matched for each and every object. (FS1 0-10, FS2 0-20) For clarity in counting objects should be placed into a line; different sized objects can be used. (FS2 Pictorial representations alongside for fluidity)	Count out a number of objects from a larger collection, know the number they stop counting at will give the total number of objects. Use of numeral and numicon to reinforce what a number 'looks like'.	To show the children that our numbers are made up of other numbers .e.g 5 is 5 ones, but also 3 and 2 ones. Forms the concept of the size of numbers and supports ordinal number sense.

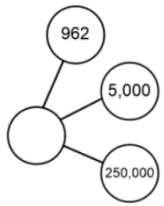
Pre Counting Ideas	One to One Correspondence Ideas	Cardinality Counting Ideas	Conservation of numbers Ideas
Sort groups of objects using the language of more, less and the same. Concrete Resources • Compare Bears • Pebbles (different sizes/lengths) • Sticks Which group has the most? Which group has the least?	Counting games: • Counting songs (ensure counting forwards as well as backwards) • Representing numerals and amounts through a narrative linked to story e.g "Little Red Riding Hood has 3 friends coming to her party, she needs 3 slices of cake, can you count 3?" • Introduce numicon and tens frames to show different representations and assist with accuracy in counting.	 How many bananas are there in my fruit bowl? Allow children to physically handle the fruit. Provide children with objects to point to and move as they count and say the numbers.	• Use of numberblocks to introduce the concept of numbers 'breaking' and 'forming' • Use of numicon to show different representations of the 'ness' of a number. • 2 different colours of counters on a tens fame.
Greater Depth Pictorial representation How could we make the groups the same? What would happen if...?	**Greater Depth** Child can count from any given starting point independently selecting using resources to support them. • Hundred Square • Number Line • Numicon • Tens Frames	**Greater Depth** Child can confidently 'explain' and represent numbers in different ways selecting appropriate resources to 'prove' their understanding. E.g Printing with sponges/ numicon to show a numeral, children know to stop when they get to the right amount.	**Greater Depth** Use the part, part whole model: using numerals, dots/lines, missing boxes etc. 

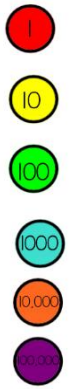
PROGRESSION IN THE TEACHING OF PLACE VALUE

Year 1	Year 2	Year 3	Year 4

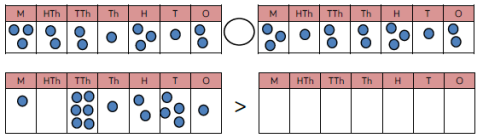
Understanding numbers up to 100	Understanding numbers up to 100	Understanding numbers up to 1,000	Understanding numbers up to 10,000 including decimals
-Count to and across, forwards and backwards to and from 100 from any number. -Read and write numbers to 100 in numerals. -Count in multiples of 2,5 and 10. -Identify numbers that are one more and one less, equal, more than, less than, fewer, most and least. -Read and write numbers to 20 in numerals and words.	-Recognise the place value of each digit in a 2 -digit number. -Order and compare numbers up to 100 (<, >, =) -Count in steps of 2,3 and 5 from 0. - Count in tens from any number forwards and backwards. -Read and write numbers to at least 100 in numerals and in words. -Identify, represent and estimate numbers. -Solve problems with number facts and place value.	-Recognise the place value of each digit in a 3-digit number -Order and compare numbers up to 1,000 -Read and write numbers up to 1,000 in numerals and in words -Count from 0 in multiples of 4,8,50 and 100. -Find 10 or 100 more/ less than a give number. -Read Roman numerals to 20.	-Recognise the place value of each digit in a 4-digit number. -Order and compare numbers beyond 1,000 -Recognise and write decimal equivalents of any number of tenths or hundredths -Count in multiples of 6,7,9, 25 and 1000. -Find 1000 more/ less than a given number. -Count backwards through 0 to include negative numbers. -Round any number to the nearest 10, 100 and 1000. -Read Roman numerals to 100.
Cubes/ counters, Tens frames, Numicon, arrow cards and  Di 	Develop place value using different representations and manipulatives e.g. tens frame, Numicon, money and Diennes. 	Develop place value through the progressive use of manipulatives.   The difference in size of the manipulatives between the hundreds, tens and ones helps children to understand the difference in the value of each digit.	 Continue developing place value through the use of the manipulatives. - Diennes -Place value counters -Place value arrow cards -Place value charts

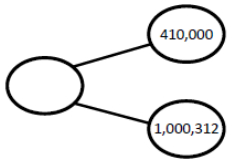
Year 5	Year 6
Understanding numbers up to 1,000,000 including decimals -Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit -Read, write, order and compare numbers with up to 3 decimal places -Count forwards or backwards in steps of powers of for any given number up to 1,000,000. -Interpret negative numbers in context. -Read Roman numerals to 1,000 (M). -Recognise years written in Roman numerals. -Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000.	**Understanding numbers up to 10,000,000** -Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit -Round any whole number to a required degree of accuracy. -Use estimation to check answers to calculations. -Use negative numbers in context, and calculate intervals across 0. -Solve number and practical problems that involve all of the above.

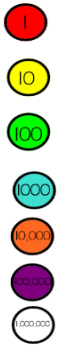




Start number	Rounded to the nearest 10	Rounded to the nearest 100	Rounded to the nearest 1,000
			
			
DCCLXIX			







PROGRESSION IN THE TEACHING OF CALCULATIONS

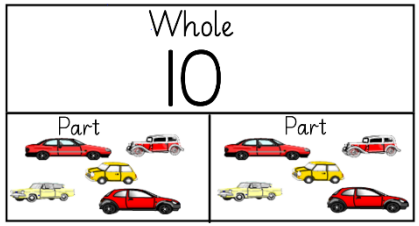
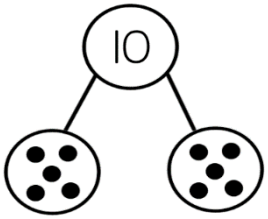
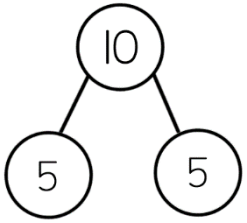
Curriculum objectives

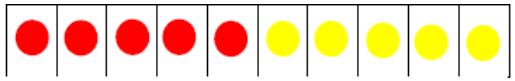
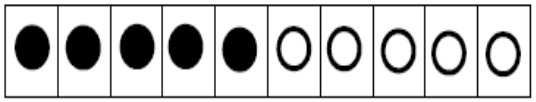
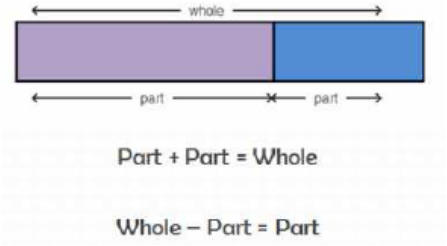
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	**Add 1-digit and 2-digit numbers to 20, including zero** - Combining two parts to make a whole: part whole model. - Starting at the bigger number and counting on. -Regrouping to make 10. -Use number facts to bridge through 10.	**Add a 2- digit number and ones, a 2 digit- number and tens, two 2-digit numbers and three 1-digit numbers.** -Starting at the bigger number and counting on. -Use number bonds to bridge through ten (partitioning). -Partitioning tens and ones. -Making 10 and adding on.	**Add numbers with up to 3-digits.** -Add a one, ten and hundred to a 3- digit number using Diennes then mentally. -Use formal written method (columnar). -Solve missing number problems.	**Add numbers with up to 4 digits.** -Add using columnar addition, where appropriate and why. -Rounding with adjusting mentally. -Partitioning with jottings. -Estimate and use inverse to check answer. -Solve two step problems.	**Add numbers with more than 4- digits.** -Add increasingly large numbers mentally. -Add numbers with more than 4- digits using formal columnar methods. -Use rounding to estimate and to check answers to calculations. -To solve multi-step problems deciding on the best operation to use and why.	**Solve addition problems, deciding which operation and method to use and why.** -Solve multi-step problems in contexts, deciding which operation and method to use and why. -Solve problems involving addition. -Use knowledge of the order of operations in order to carry out calculations involving the four operations.
Subtraction	**Subtract 2-digit and 1-digit numbers to 20, including zero.** -Counting back in ones. -Taking away ones (crossing out). -Part whole model. -Find the difference	**Subtract a 2- digit number and ones, a 2 digit- number and tens, two 2-digit numbers and three 1-digit numbers.** -Counting back in ones. -Partitioning into tens and ones using part, part whole model, including regrouping. -Find the difference on an empty number line.	**Subtract numbers with up to 3- digits.** -Subtract a one, ten and hundred from a 3- digit number using Diennes then mentally. -Use formal written method (columnar). -Solve missing number problems.	**Subtract numbers with up to 4 digits.** -Subtract using columnar subtraction where appropriate and why. -Rounding with adjusting mentally. -Partitioning with jottings. -Estimate and use inverse to check answer. -Solve two step problems.	**Subtract numbers with more than 4-digits.** -Subtract increasingly large numbers mentally. -Subtract numbers with more than 4-digits using formal columnar written methods. -Use rounding to estimate and to check answers to calculations. -To solve multi-step problems deciding on the best operation to use and why.	**Solve subtraction problems, deciding which operation and method to use and why.** -Solve problems involving subtraction. -Solve multi-step problems in contexts, deciding which operation and method to use and why. -Use knowledge of the order of operations in order to carry out calculations involving the four operations.
Multiplication	**Solve one step multiplication problems.** -Doubling	**Multiply two 1-digit numbers.**	**Multiply 2- digit by 1-digit numbers.**	**Multiply 2-digit and 3-digit by 1-digit numbers.**	**Multiply numbers up to 4-digits by 1-digit numbers.**	**Multiply multi-digit numbers with up to 4-digits by 2-digit numbers.**

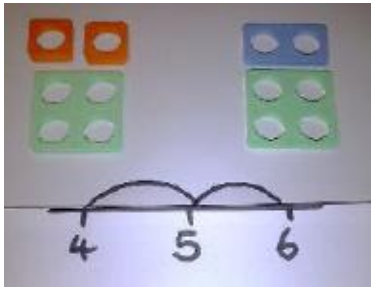
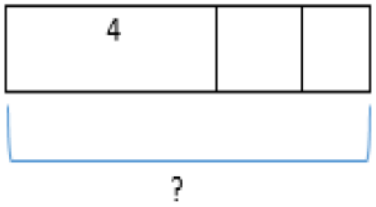
	-Count in multiples of 2,5 and 10 (equal groups) -Repeated addition -Arrays	-Recall and use their 2,5 and 10 times tables. -Understand that multiplication is repeated addition including arrays. -Understand that multiplication is commutative. -Use inverse.	- Calculate using the (3,6,4 and 8) times tables they know. -Partition and use repeated addition. -Use mental methods, progressing to formal written methods. -Solve scaling, missing number and correspondence problems.	-Recall and use their times tables up to 12x12. -Use place value and facts to multiply mentally including, 0 and 1. -Multiply three numbers -Recognise and use factor pairs and commutativity. -Use formal written layout. -Solve distributive law, integer scaling and correspondence problems.	**Multiply 4-digit numbers by a 2-digit number.** -Identify common factor pairs of two numbers. -identify factors, including all factor pairs. -Identify multiples. -Multiply numbers mentally. -Multiply up to 4-digit numbers by 1- digit number using a formal written method. -Multiply up to 4 digit numbers by a 2-digit number using long multiplication. Multiply whole numbers and those involving decimals by 10, 100 and 1000. -Solve multiplication problems using knowledge of factors, multiples, squares and cubes. -Solve multiplication problems including scaling by simple fractions and problems involving simple rates. -Use the vocabulary prime factors. -Recognise and use cube numbers and the notation of cubed. -Recognise and use square numbers and the notation of squared.	-Identify common factors. -Identify common multiples. -Multiply up to 4-digit, multi- digit numbers by 2-digit whole numbers using the formal written method of long multiplication. -Perform mental calculations. -Use common multiples to express fractions in the same denomination. -Use knowledge of the order of operations in order to carry out calculations involving the four operations.
Division	**Solve one step division problems.** -Halving -Sharing into equal groups. -Division as grouping.	**Divide two 1- digit numbers.** -Division as grouping -Sharing into equal groups. -Use inverse	**Divide 2- digit by 1- digit numbers.** -Recall division facts for the times tables they know. -Solve missing number problems. - Solve 2-digit divide by 1-digit problems mentally, with place value counters then moving to formal written methods.	**Divide 2- digit and 3- digit by 1-digit numbers.** -Partition and group the hundreds, tens and ones. -Use knowledge of 12 x 12 to find related division facts. -Use place value and facts to divide mentally including dividing by 1.	**Divide 4- digit numbers by 1-digit numbers.** -Divide numbers mentally. -Recall prime numbers up to 19. -Divide up to 4-digit numbers by a 1-digit number and interpret remainders appropriately for the context.	**Divide up to 4-digit numbers by 2-digit whole numbers.** -Divide up to 4-digit numbers by 2-digit numbers using formal written methods of short division where appropriate. -Divide up to 4-digit numbers by 2-digit whole numbers using formal written method of long

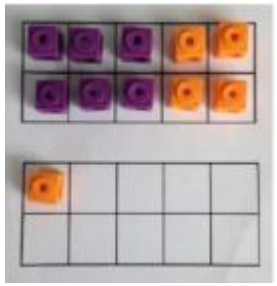
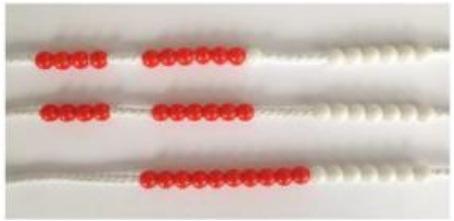
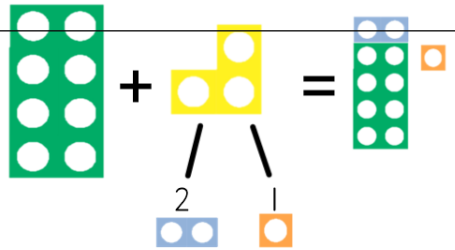
					-Divide up to 4-digit numbers using formal written method of short division. -Divide whole numbers and decimals by 10, 100 and 1000. -Establish whether a number up to 100 is prime. -Solve division problems using knowledge of factors, multiples squares and cubes. -Use the vocabulary of composite (non-prime) numbers. -Use the vocabulary of prime numbers.	division and to interpret remainders as whole number remainders, fractions or by rounding. -Divide up to 4-digit numbers by 2-digit numbers using formal written method of long division. -Identify prime numbers. -Use common factors to simplify fractions. -Use knowledge of the order of operations in order to carry out calculations involving the four operations.

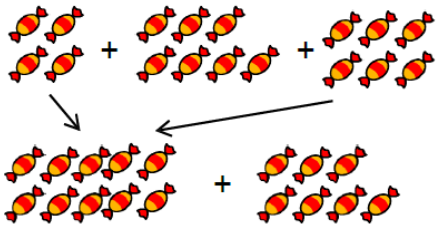
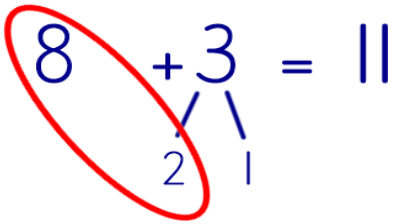
ADD IT!

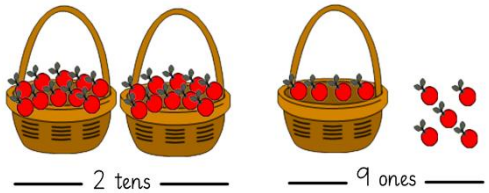
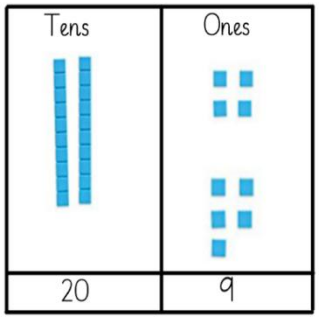
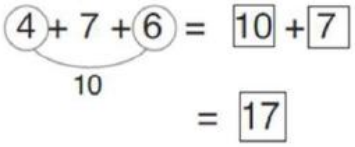
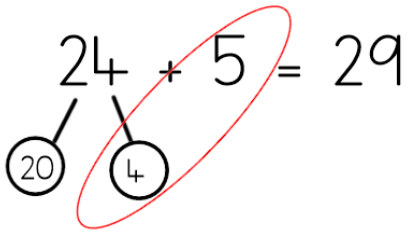
Curriculum objective and strategies	Concrete	Pictorial	Abstract
Combine two parts to make a whole (part, part whole model).			

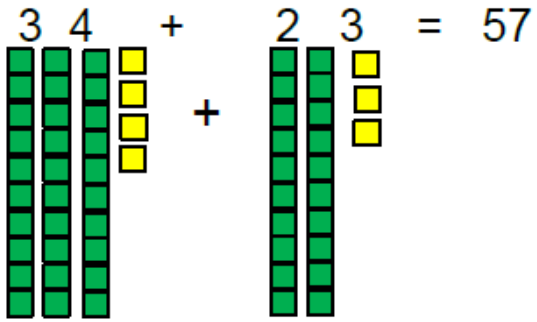
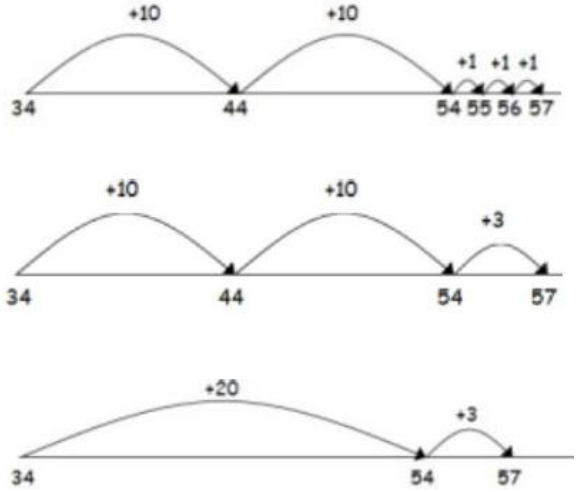
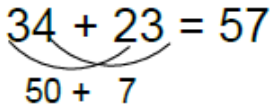
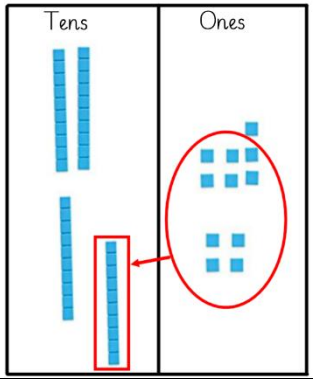
Start at the bigger number and count on.	   	  The bar model which encourages the children to count on.	5 + 5 = 10 10 = ___ + 5 4 + 7 = 11 The abstract number line: What is 2 more than 4? What is the sum of 4 and 4? What's the total of 4 and 2? 4 + 2

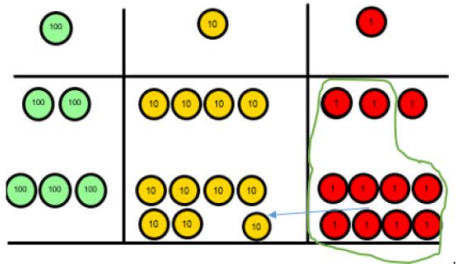
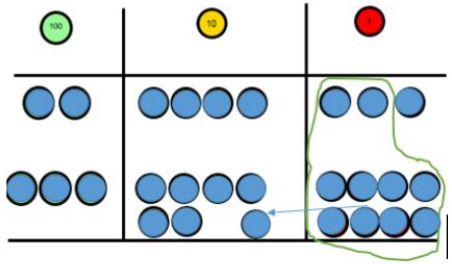
<table>
<tr>
<td></td>
<td> 
</td>
<td> 
</td>
<td></td>
</tr>
<tr>
<td>Regrouping to make 10.

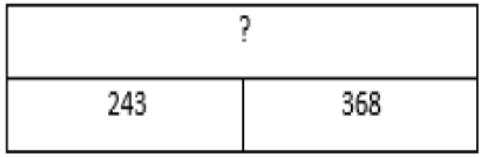
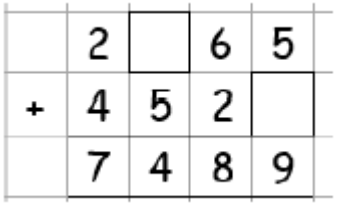
Adding 3 single digit numbers.</td>
<td> 
 
4 + 7 + 6 =
  </td>
<td> 

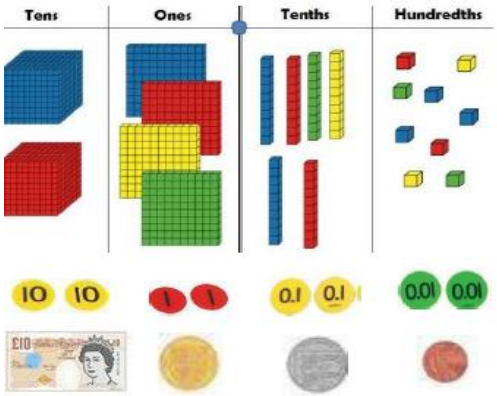
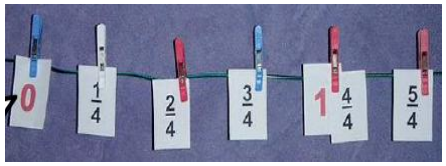
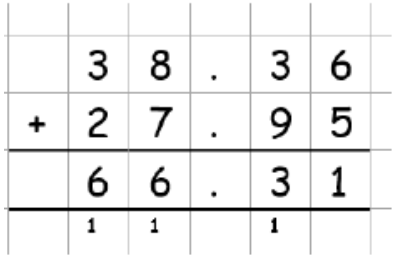
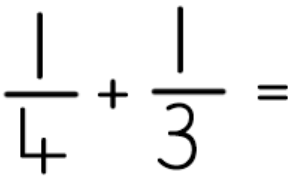
  </td>
<td> 
</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</table>

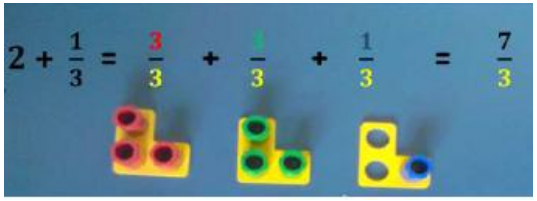
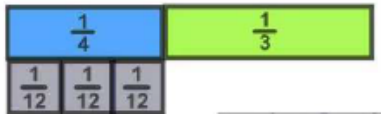
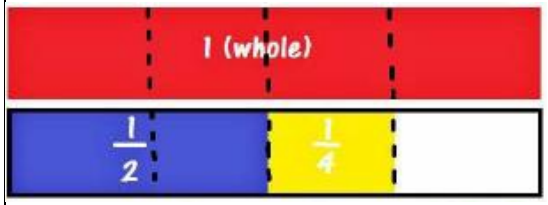
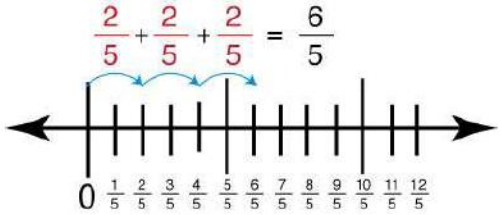
Partitioning tens and ones. Adding without regrouping.	Encourage the children to put the 4 and 6 together to make 10.  	 	Combine the two numbers that make 10, then add the remainder.  

		34 + 23 = 57 	Combine the tens and ones:  OR 34 + 23 34 + 20 = 54 + 3 = 57
Adding with regrouping.	 Hannah has 27 crayons. Tom has 14 crayons.	Children can draw pictorial representations of the columns and place value counters. 	

Partitioning three digit numbers with Diennes and then place value counters.			27 + 14 = 41 3 1
			Formal method: 27 + 14 41 1

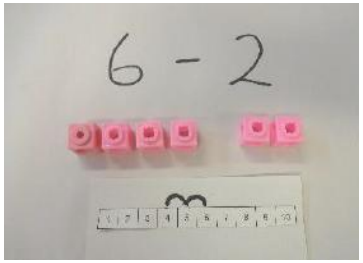
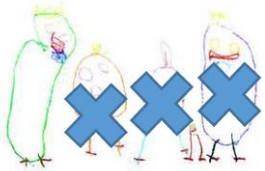
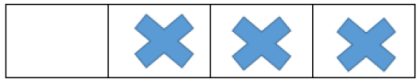
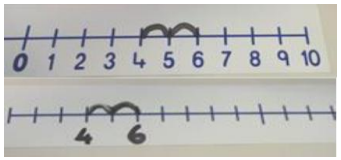
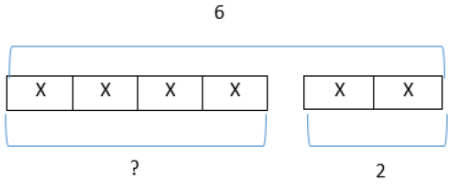
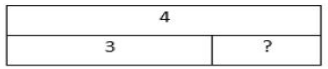
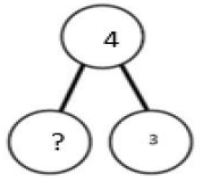
Adding more than 4-digit numbers using the formal columnar method.	As above with the relevant place value columns.	If the children are completing a word problem, draw a bar model to represent what it's asking them to do.  As above with the relevant place value columns.	243 +368 611 1 1
Adding decimals		As above but with pictures of the decimal place value counters.	Children should be using rounding to estimate and the inverse to check their calculations. 

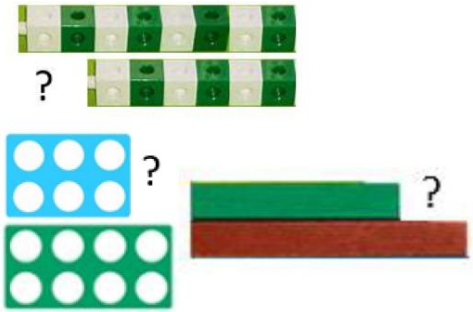
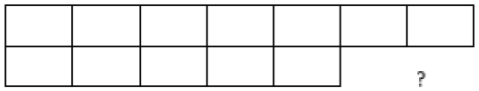
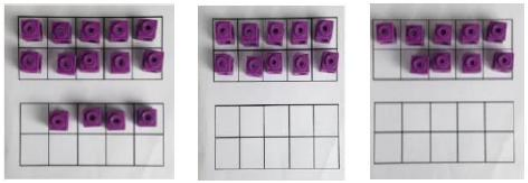
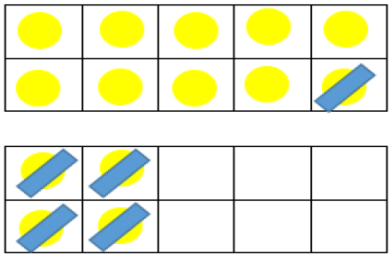
Add fractions	When introducing the addition of decimals, begin with Diennes before moving onto place value counters and money.   		Children should be rounding to estimate and using the inverse to check their answers.  

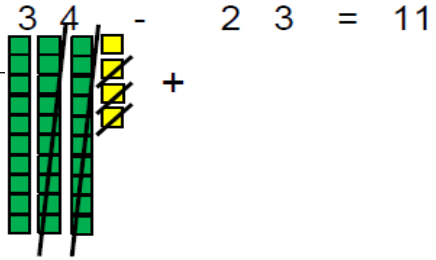
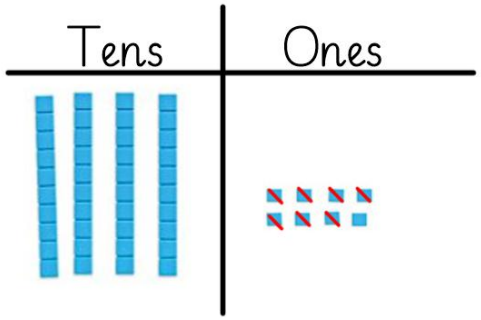
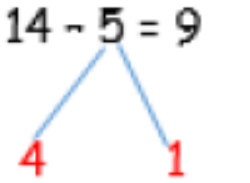
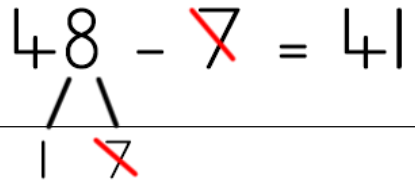
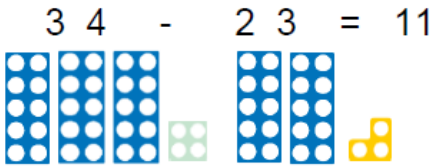
Multi-step problems		$\frac{1}{4} + \frac{1}{3}$   	$\frac{3}{12} + \frac{4}{12} = \frac{7}{12}$ Understand the use of brackets and the associative law of addition. e.g. (a + b) + c = a + (b + c) (1 + 2) + 5 = 1 + (2 + 5)

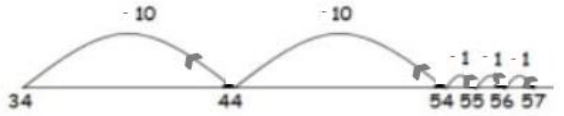
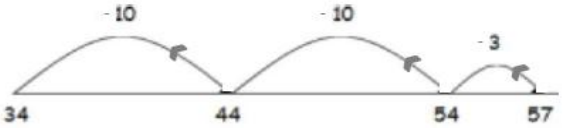
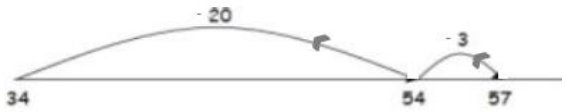
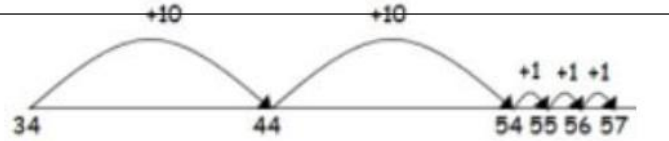
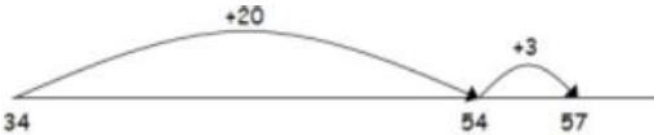
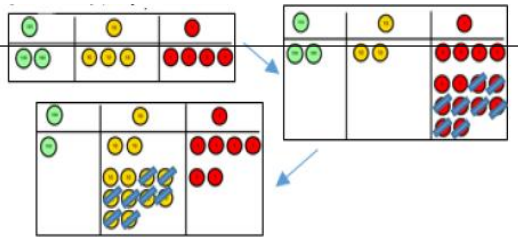
			Begin to understand the order of operations- BODMAS

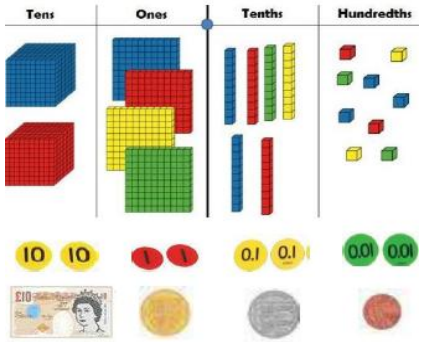
SUBTRACT IT!

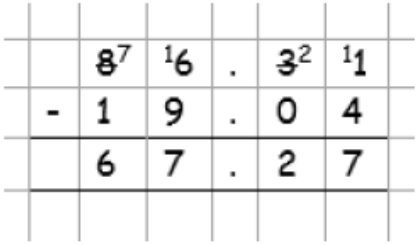
Curriculum objective and strategies	Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole. Counting back	  	Children to draw the concrete resources they are using and cross out.  Use of the bar model:  Counting back on a number line:  Children to represent what they see pictorially e.g. Children to draw the cubes/other concrete objects which they have used. 	4- 3 = □ = 4 - 3   Put 13 in your head, count back 4. What number are you at? Use related subtraction facts e.g. 5-2= 3 so 15- 2 = 13 14 - □ = 11 15 = 17 - □

Find the difference		XXXXXXXX XXXXXX Use of the bar model 	Find the difference between 8 and 6. 8-6, the difference is? Children to start at 6 and count on. It is worth talking to children about the two methods of subtraction at this point and which should be used when. When the numbers are close together, then it is easier to find the difference. However, when you are only taking away small amounts, e.g. 14-3, then counting back is easier. Children to explore why 9-7 = 8 – 6 (the difference, of each digit, has changed by 1 but the difference is the same).
Making 10	14-5  Children could also do this by subtracting a 5 from the 10. 	Children to present the ten frame pictorially. 	Children to  represent how they solved it e.g.

Partitioning tens and ones.	48-7=  		 
Subtracting without exchanging	Children to make both numbers and compare the difference. 	Empty number lines. Counting back:	Counting back: 57-23 57-3=54-20=34

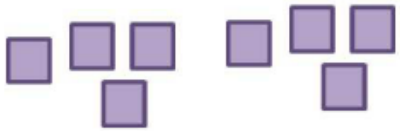
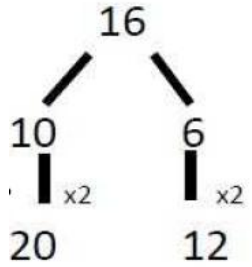
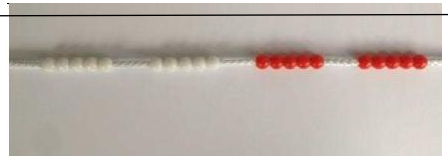
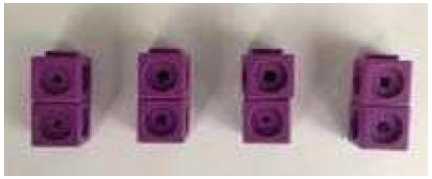
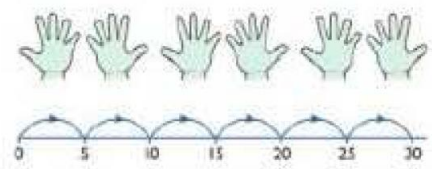
	The first number has an extra ten and an extra one so the difference is 11.	57 - 23 = 34    Counting on to find the difference: 57 - 34 = 23   	Comparing the tens and the ones of each number. 57 - 23 = 34 30 + 4 34 + 23 = 57 Use the inverse to check:
Subtracting with exchanging			

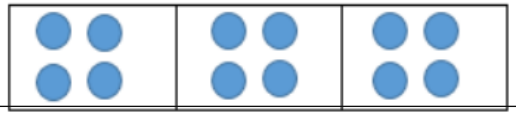
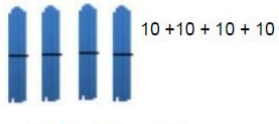
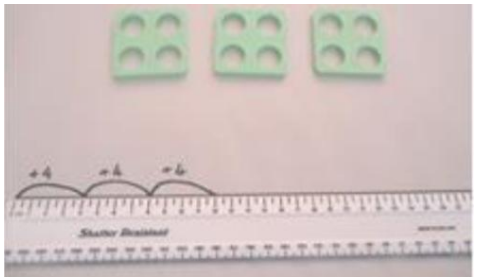
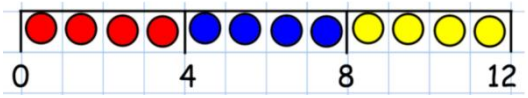
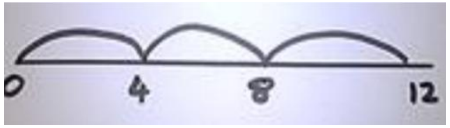
Subtracting decimals	As with the addition, the subtraction of decimals should be introduced using Diennes. This ensures the children understand the difference between each decimal place. 	Once the children have had practice with the concrete, they should be able to apply it to any subtraction. Like the other pictorial representations, children to represent the counters.	$$\begin{array}{r} {}^{2}\not{2}\,{}^{1}3\,4 \\ -\;\;8\,8 \\ \hline \quad\;\; 6 \end{array}$$ Children should be using rounding to estimate and the inverse to check their answers. $$\begin{array}{rcccc} & 7 & \square & 6 & 5 \\ - & 4 & 5 & 2 & \square \\ \hline & 3 & 4 & 3 & 9 \end{array}$$

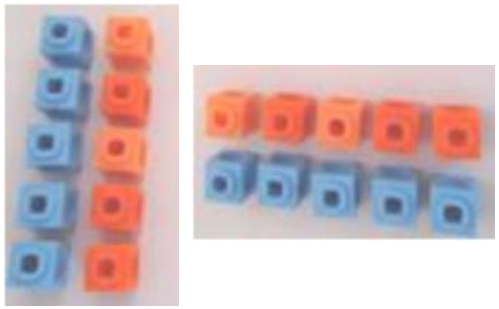
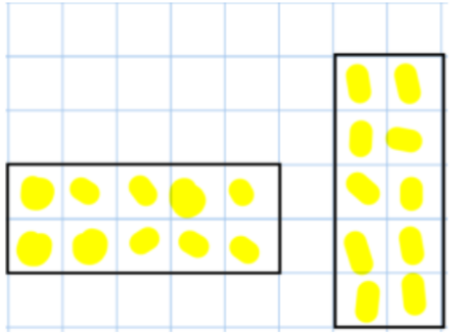
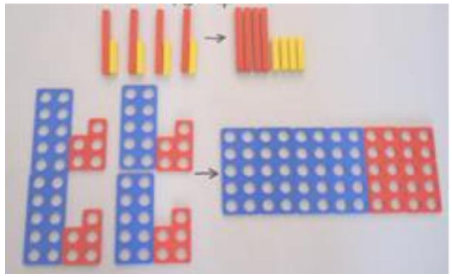
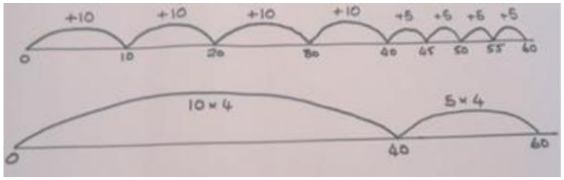
		Represent the value of each digit using pictures of the place value counting. Children can draw place value counters to support them in their calculating.	Children should be using rounding to estimate and the inverse to check their answers.  $\begin{array}{r} \not{8}^{7}\,\not{6}^{1}.\not{3}^{2}\not{1}^{1} \\ -\ 1\ 9.0\ 4 \\ \hline 6\ 7.2\ 7 \end{array}$

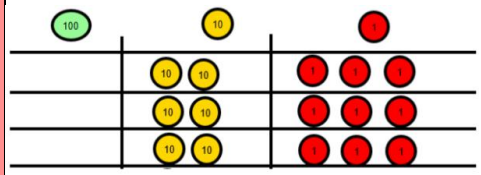
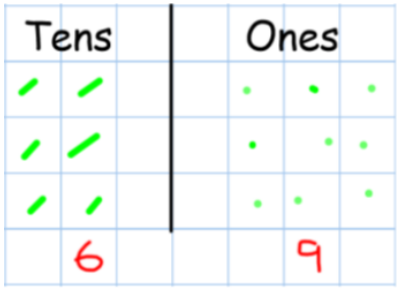
MULTIPLY IT!

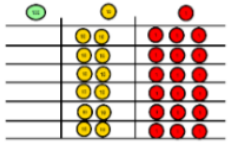
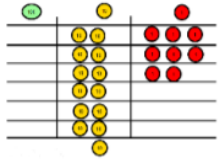
Curriculum objective and strategies	Concrete	Pictorial	Abstract

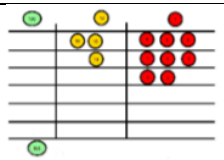
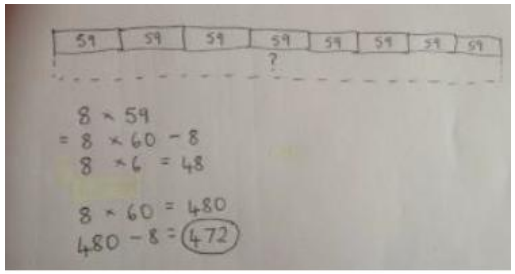
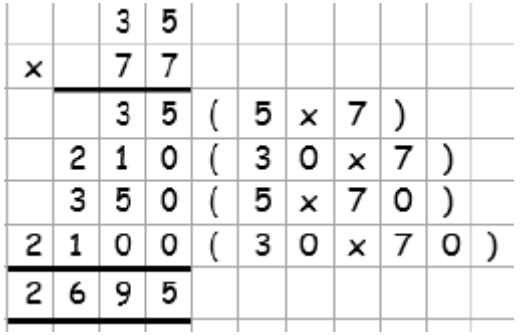
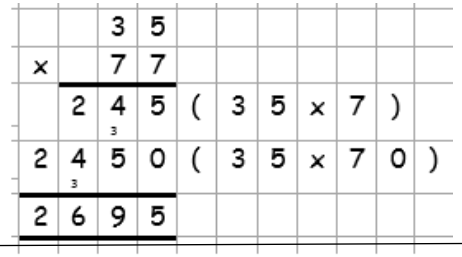
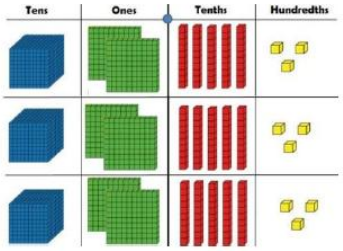
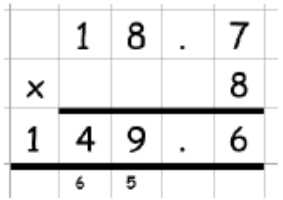
Doubling	Use practical activities to show how to double a number. 	Draw pictures to show how to double a number. 	Double 16  Partition a number and then double each part before recombining it back together. Children to roll numbers using fingers to support them.
Counting in multiples	  3 x 4 or 3 lots of 4	Use the pictorial representations to support the children in rolling their numbers.  Children to represent the practical resources in a picture e.g.	2, 4, 6, 8, 10, 12, 14 5, 10, 15, 20, 25 , 30 10, ☐, 30, 40, 50, ☐ 3 x 4 4 + 4 + 4

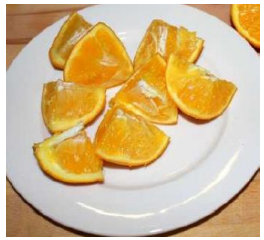
Repeated grouping/ repeated addition	(does not have to be restricted to  cubes)	XX XX XX XX XX XX Use of a bar model for a more structured method. 	
Use number lines to show repeated groups	  3 x 4 	Represent this pictorially alongside a number line e.g: 	Abstract number line 3 x 4 = 12  Children to be able to use an array to write a range of calculations e.g.

Use arrays to illustrate commutativity	2 x 5 = 5 x 2 	 Children to represent the concrete manipulatives in a picture e.g. Diennes can be represented like:	2 x 5 = 10 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 5 + 5 = 10 Children to be encouraged to show the steps they have taken.
Partition to multiply	Use numicon, Diennes, Cuisenaire rods 4 x 15 	15 x 4 T O XXXXX XXXXX XXXXX XXXXX	4 x 15 10 5 10 x 4 = 40 5 x 4 = 20 40 + 20 = 60 

Formal column method -no exchanging	Make 23, 3 times. See how many ones then how many tens. 	Children to represent the counters in a pictorial way. 	Children to record what it is they are doing to show understanding. 3 x 23 20 3 3 x 20 = 60 3 x 3 = 9 60 + 9= 69 23 x 3 69

Formal column method	Children to represent with place value counters (children need this stage, initially, to understand how the column methods words). 6 x 23 **Step 1**: get 6 lots of 23  **Step 2**: 6 x 3 is 18. Can I make an exchange? Yes! Ten ones for one ten...  **Steps 3**: 6 x 2 tens and my extra ten is 13 tens. Can I make an exchange? Yes! Ten tens for one hundred...		6 x 23 6 x 3 = 18 6 x 20 = 120 120 + 18 = 138 The aim is to get to the formal method but the children need to understand how it works. 6 x 23 = $$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

	 **Steps 4**: What do I have in each column? 	Bar modelling can support learners when solving problems with multiplication alongside the formal  written methods.	 This then moves to the more compact method: 
Multiplying decimals	12.53 x 4 		Decimals: 

Multiplication of fractions	Count in fraction steps (what would three lots of one eighth be?) 		$3 \times {}^{1}/_{8} =$ $\frac{3}{1} \times \frac{1}{8} = \frac{3}{8}$

When children start to multiply 3d x 4d and 4d x 2d etc, they should be confident with the abstract:

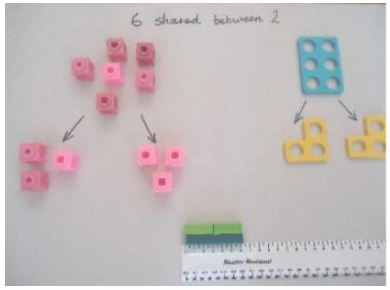
To get 744, they have solved 6 x 124

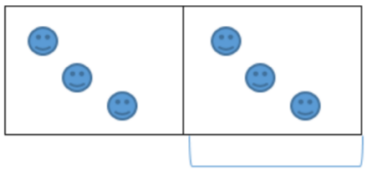
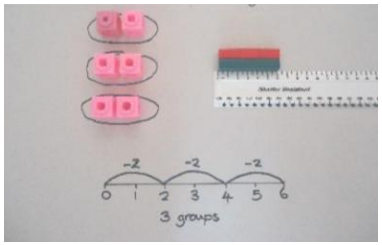
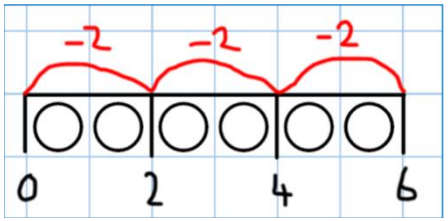
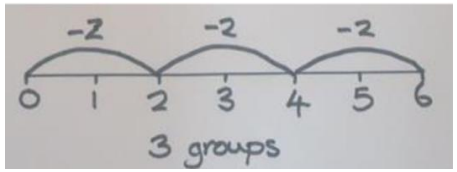
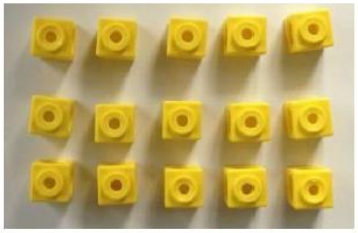
To get 2480, they have solved 20 x 124

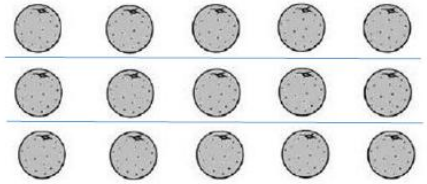
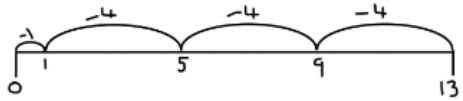
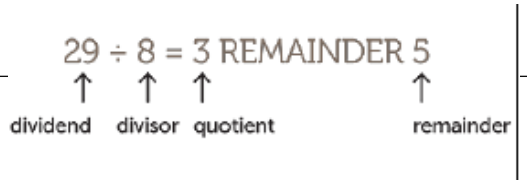
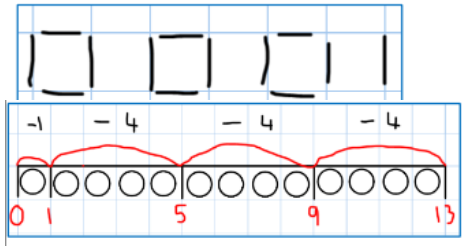
$$\begin{array}{rrrr} & 1 & 2 & 4 \\ \times & & 2 & 6 \\ \hline & {\scriptstyle 1}7 & 4 & 4 \\ 2 & {\scriptstyle 2}4 & 8 & 0 \\ \hline 3 & 2 & 2 & 4 \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & \end{array}$$

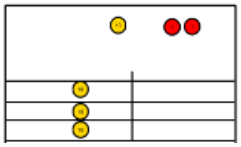
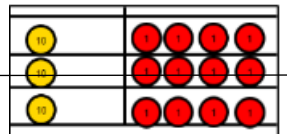
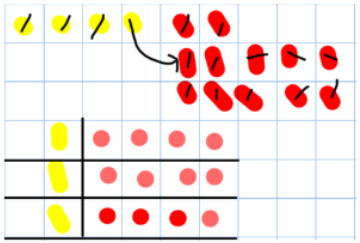
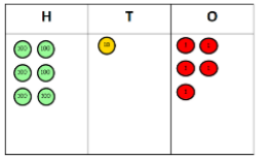
Answer: 3224

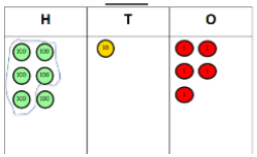
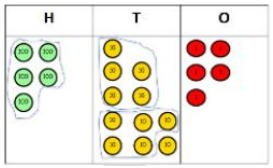
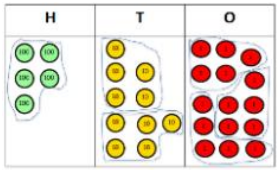
DIVIDE IT!

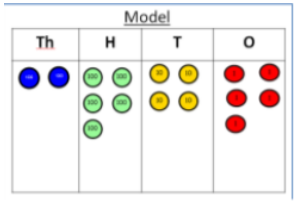
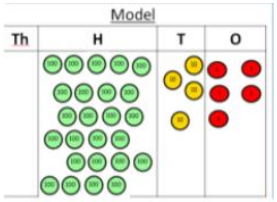
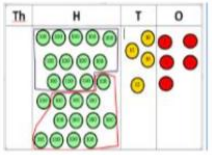
Curriculum objective and strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	6 shared between 2.  	 This can be done in a bar so all 4 operations have a similar structure.	6 ÷ 2 = 3 What's the calculation? 3 | 3

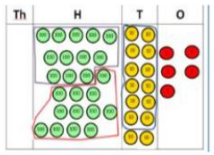
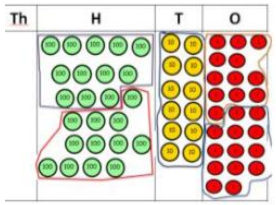
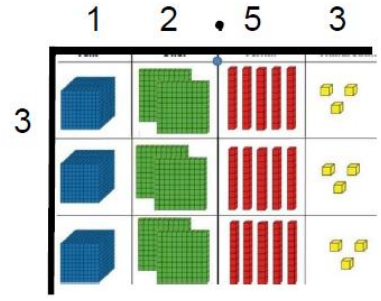
			
Division as repeated grouping and subtracting			Abstract number line  How many groups of 2 can you make out of 8?
Division within an array	Division links to multiplication by creating an array.  E.g. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15		Find the inverse of multiplication and division sentences by creating four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7

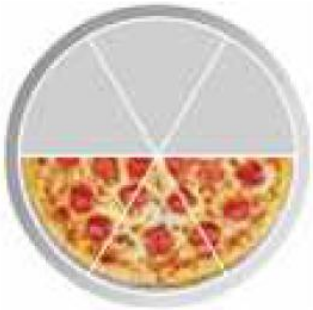
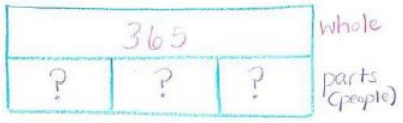
Division with remainders	At this point, discuss whether division is commutative. Use of lollipop sticks to form wholes 	Children to draw an array and use links to split the array into groups to make multiplication and division number sentences.  E.g. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	How would you solve this? □ ÷ 2 = 12 2 x 12 = 24   29 ÷ 8 = 3 REMAINDER 5 dividend divisor quotient remainder
Sharing using place value counters	42 ÷ 3= 14 1.Make 42. Share the 4 tens between 3. Can we make an exchange with the extra 10?		

	 2. Exchange the ten for 10 ones and share out 12. 		42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14
Use of the 'bus stop method'	Using grouping and counters. Key language for grouping- how many groups of x can we make with x hundreds (this can also be done using sharing). 615 ÷ 5 **Step 1:** Make 615  **Step 2:** Circle your groups of 5	This can be represented pictorially. It can also be done to decimal places if you have a remainder.	$\begin{array}{r} 123 \\ 5\overline{)\,6^{1}1^{1}5} \end{array}$

Long division	 **Step 3**: Exchange 1 hundred for 10 tens and circle groups of 5.  **Step 4**: Exchange 1 ten for 10 ones and circle groups of 5. 		

	2544 ÷ 12 How many groups of 12 thousand do we have? None  0 2 1 2 12 | 2544 24 14 12 24 24 0 Exchange 2 thousand for 20 hundreds.  How many groups of 12 are in 25 hundreds? 2 groups. Circle them. We have grouped 24 hundreds so can take them off and we are left with one.  0 2 12 | 2544 24 1	Children to represent the counters, pictorially and record the subtractions beneath.	**Step 1:** Exchange 2 thousands for 20 hundreds so we now have 25 hundreds. 0 12 | 2544 **Step 2:** How many groups of 12 can I make with 25 hundreds? The 24 shows the hundreds we have grouped. The one is how many hundreds we have left. 0 2 12 | 2544 24 1 **Step 3:** Exchange the 1 hundred for 10 tens. How many groups of 12 can I make 14 tens? The 14 shows how many tens I have, the 12 is how many

Division of decimals	Exchange the one hundred for 10 tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2.  $\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$ Exchange the 2 tens for 20 ones so now we have 24 ones. How many groups of 12 are in 24? 2  		I have grouped and the 2 is how many tens I have left. $\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$ Exchange the 2 tens for 20 ones. The 24 is how many ones I have grouped and the 0 is what I have left.
	 	Bar modelling can support children when problem solving:	Interpret remainders as whole number remainders, fractions or by rounding, depending on the context:

Division of fractions	$\frac{1}{2} \div 3 =$ 	 $365 \div 3 = ?$ $\frac{1}{2} \div 3 =$ 	3018 ÷ 8 0 3 7 7 . 2 5 8 ~~3~~ $^{3}0$ $^{6}1$ $^{5}8$. $^{2}0$ $^{4}0$ **or** 377 r 2 **or** $377\ ^{2}/_{8}$ Decimals: 0 2 4 7 . 7 9 5 ~~1~~ $^{1}2$ $^{2}3$ $^{3}8$. $^{3}9$ $^{4}5$ $\frac{1}{2} \div {}^{3}/_{1} =$ $\frac{1}{2} \times {}^{1}/_{3} = {}^{1}/_{6}$

PROGRESSION OF TEACHING IN THE TIMES TABLES

FS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
To count in multiples of 1, 2 and 10.	To count in multiples of 2, 5 and 10.	To know the 2, 5 and 10 times table To count in multiples of 3.	To know the 3, 6, 4 and 8 times table.	To know the 7, 9, 11 and 12 times table	Regular consolidation of all times tables.	

Times tables are at the core of arithmetic fluency. Once the children have learnt their times tables by heart, they are then able to work far more confidently and efficiently through a wide range of more advanced calculations. At Cherry Tree Hill Primary School, we believe that through a variety of interactive, visual, engaging and rote learning techniques most children can achieve the full times table knowledge by the end of Year 4.

Developing children's fluency

Times tables are introduced using Rolling Numbers. Children are encouraged to count the multiples using their fingers. The aim is for children to be able to recall their times table facts with speed and accuracy. Children are explicitly taught how to work out unknown facts.

Homework

Children are set one piece of maths homework each week which consolidates their understanding of the mathematical concepts they have been taught that week. Also, children are encouraged to use Times Table Rockstars.