Calculation Policy

This policy has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added.

March 2018

Aims of the Calculation Policy

- Outline appropriate methods to use to teach clarity and understanding in addition, subtraction, multiplication and division across the primary phase
- Clarify progression in mathematics across Key Stage 1 and Key Stage 2
- Ensure that children learn with understanding using the **concrete, pictorial and abstract** methods shown, and not just through procedural methods to simply be remembered
- Enable pupils to show their understanding using a variety of methods and explain the reasoning behind their findings

The Aims of the Curriculum

The national curriculum for mathematics aims to ensure that all pupils:

- Become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problem problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- Reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- Can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering solutions

Concrete – Pictorial – Abstract

Concrete – using manipulatives

Pictorial – drawing their own representations of the concrete e.g. number lines, base ten, jottings

Abstract – calculations using numerals and symbols

"Children aged seven to ten years old work in primarily concrete ways and that the abstract notions of mathematics may only be accessible to them through embodiment in practical resources." Jean Piaget (1951)

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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part – whole model Starting at the bigger number and counting on Regrouping to make 10	Add a two digit number and ones. (Add TO + O) Add two, two digit numbers (TO + TO) Add a two digit number and tens Add three one digit numbers Using the inverse to find the missing number (Difference)	Column addition with no regrouping. (Numbers up to three digits) Column addition with regrouping. (Numbers up to three digits)	Column method regrouping (up to 4 digits)	Column method regrouping with at least 4 digits, including money and measures	Column method regrouping with several numbers (increasing complexity), including money, measure and decimals with different decimal points.
Subtraction	Taking away ones Counting back Find the difference Part-Part-Whole model Make 10	Regroup a ten into ten ones. Partitioning to subtract without regrouping Make ten strategy	Column subtraction without regrouping Column subtraction with regrouping Introduce decimal subtraction through context of money.	Column subtraction subtract with up to 4 digits (with and without regrouping)	Column subtraction Subtract with at least 4 digits, including money and measures.	Column Subtraction Subtract with increasingly large and more complex numbers and decimal values.
Multiplication	Doubling Counting in multiples /repeating groups Repeated addition Understanding arrays	Arrays showing commutivity Doubling Counting in multiples of 2, 3, 4, 5, 10 from 0 Using the inverse	Grid method Expanded short multiplication (TO x O) leading to introduction of short multiplication (TO x O)	Expanded short multiplication (HTO x O) leading to short multiplication (HTO x O)	Column Multiplication Up to 4 digits by a 1 or 2 digit number ThHTO x O ThHTO x TO Long multiplication for two-digit numbers	Column Multiplication Up to 4 digits by a 1 or 2 digit number ThHTO x TO Long multiplication for two-digit numbers
Division	Sharing objects into groups Division as grouping	Division as sharing and grouping	Division with arrays Division using remainders Introducing Short division (no remainders, no regrouping) Introducing Short division (no remainders, regrouping)	Short division Divide at least 3 digit numbers by 1 digit. (no regrouping) Short division Divide at least 3 digit numbers by 1 digit. (regrouping)	Short Division: Divide numbers up to 4 digits by a 1 digit number (regrouping)	Short Division: Divide numbers up to 4 digits by a 1 digit number (regrouping) Divide numbers up to 4 digits by a two-digit number using the formal written method of short division Long division

Mathematical Vocabulary

Correct terminology	Incorrect Terminology
ones	units
Is equal to (is the same as)	equals
zero	Oh (the letter o)
exchange exchanging regrouping	Stealing borrowing
sharing grouping groups	
calculation equation	Generic term of 'sum' or 'number sentence'
bar model	
known unknown	
whole part	
Key Vocabulary	
Addition: 8 + 3 = 11 Addend Addend Sum	25 multiplicand x 6 multiplier } factors 150 product
8 - 3 = 5 Minuend Subtrahend Difference	Dividend 40 ÷ 8 = 5 Divisor Quotient 6 ← quotient 4) 24 ← dividend divisor

Definitions

Addend: Any of the numbers that are added together.

Sum: The result of adding two or more numbers

Minuend: The first number in a subtraction. The number from which another number is subtracted.

Subtrahend: The number that is to be subtracted. The second number in a subtraction.

Difference: The result of subtracting one number from another. How much one number differs from another.

Division: Division is splitting into equal parts or **groups**.

Dividend: The amount that you want to divide up.

Divisor: The number you divide by.

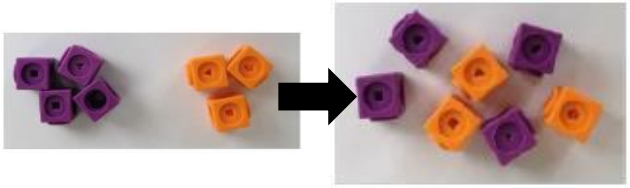
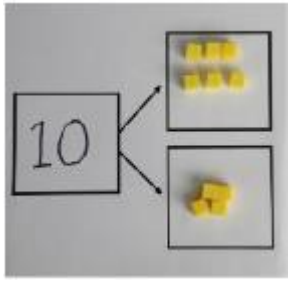
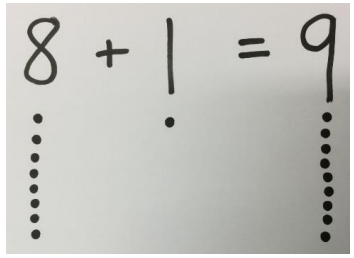
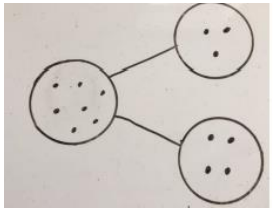
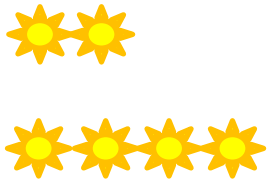
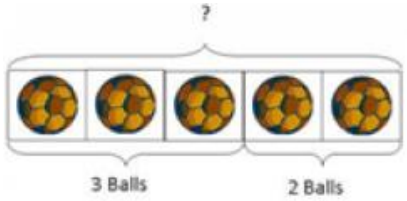
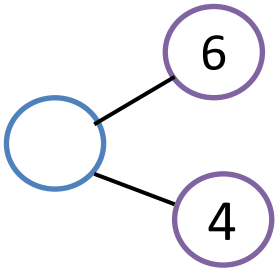
Quotient: The answer after you divide one number by another.

Multiplicand: The number that gets multiplied/ the size of the group.

Multiplier: The number that you are multiplying by/ the number of groups.

Product: The answer when two or more numbers are multiplied together.

YEAR 1 ADDITION

Addition Year 1	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part – whole model	  **Use cubes and diennes to add two numbers together either as a group, part-part-whole diagram or as a bar.** 10 = 6 + 4  8 + 1 = 9 	  **Use pictures to add two numbers together as group or in a bar.**   	 6 + 4 = __ ___ = 6 + 4 **Use the part-part whole diagram to move into the abstract.**

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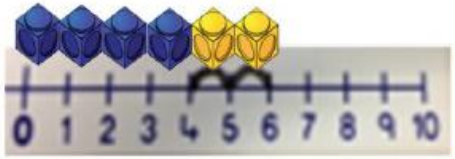
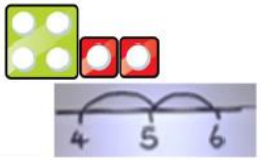
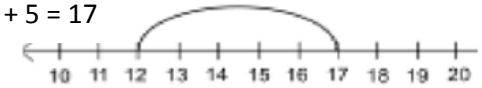
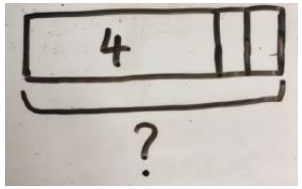
<table>
<tr>
<td>Starting at the bigger number and counting on</td>
<td>



Start with the larger number and count on the smaller number in one by one to find the answer.


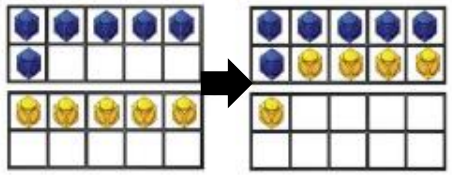
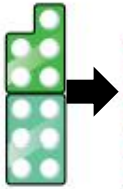
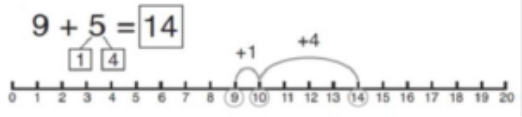
</td>
<td>
12 + 5 = 17


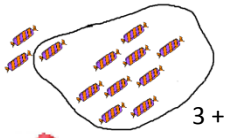
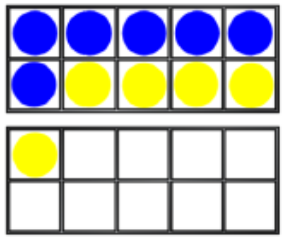
Start at the larger number on the number and count on in ones or in one jump to find the answer.


A bar model which encourages children to count on rather than count all.
</td>
<td>
12 + 5 = 17
Place the larger number in your head and count on the smaller number to find your answer.
What is 2 more than 4?
What is the sum of 2 and 4?
What is the total of 4 and 2?
4 + 2


Use a blank number line to count on.
</td>
</tr>
<tr>
<td>Regrouping to make 10

This is an essential skill for column addition later.</td>
<td>

9 + 3 = 12
Start with the bigger number and use the smaller number to make 10.
Use ten frames, bead strings counters/cubes or Numicon.
6 + 5


</td>
<td>


Use pictures or a number line.
Regroup or partition the smaller number to make 10

3 + 9 = 12


Children to fill in a ten frame with pencils, counters or cubes.
</td>
<td>
7 + 4 = 11
If I am seven how many more do I need to make 10? How many more many more do I add on now?
Children to develop an understanding of equality e.g.
6 + □ = 11
6 + 5 = 5 + □
6 + 5 = □ + 4
</td>
</tr>
</table>

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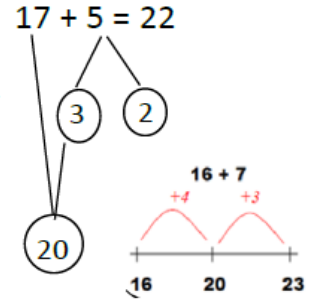
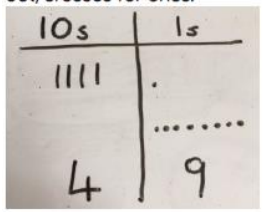
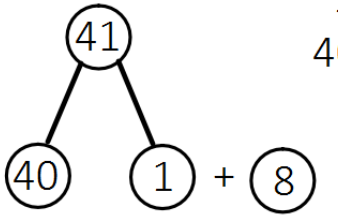
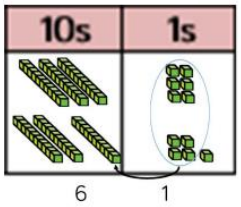
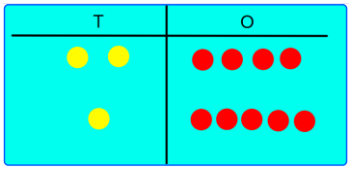
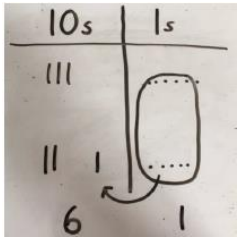
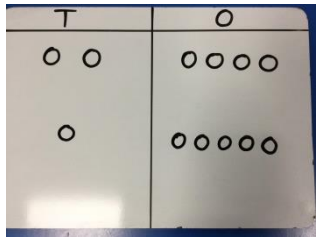
YEAR 2 ADDITION

Addition Year 2	Concrete	Pictorial	Abstract
Add a two digit number and ones. Add TO + O	Continue to develop understanding of partitioning and place value. 41 + 8 	Use part part whole and number line to model.  Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8 = 1 + 8 = 9 40 + 9 = 49  
Add two, two digit numbers TO + TO	36 + 25 =  TO + TO using base 10 first before moving onto place value counters. Continue to develop understanding of partitioning and place value.  24 + 15 =	 After practically using the resources, children to represent the base 10 in a place value chart. 36 + 25 =  Children can draw the counters in a place grid to help them solve additions.	36 + 25 = Children to apply their understanding from their use of concrete and pictorial methods to answer questions using a formal column written method. 36 25 + 61 1

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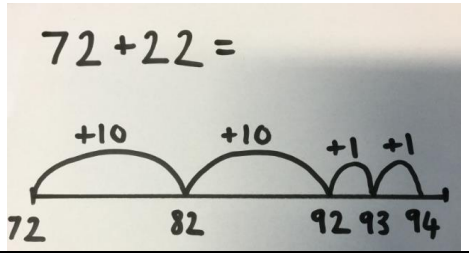
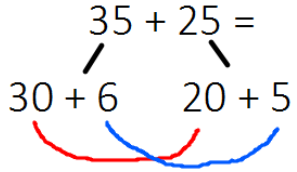
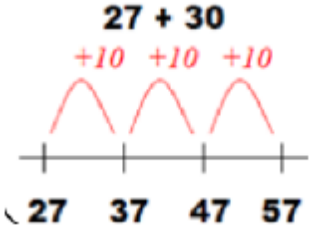
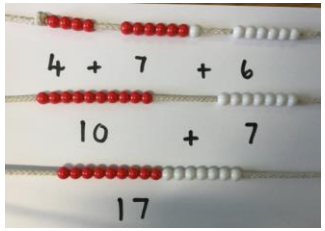
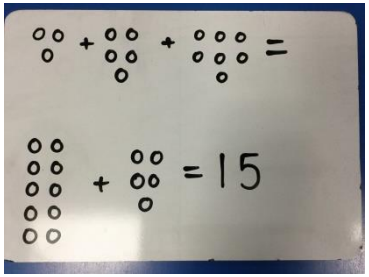
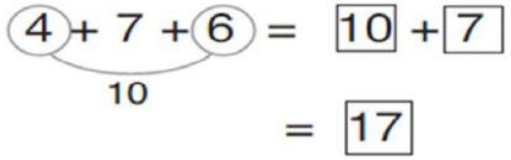
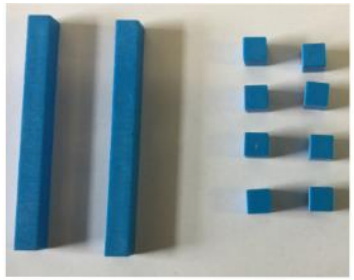
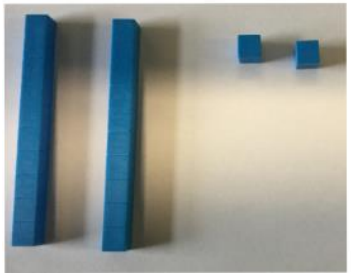
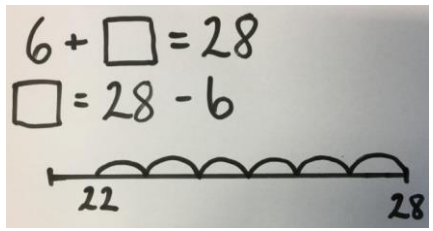
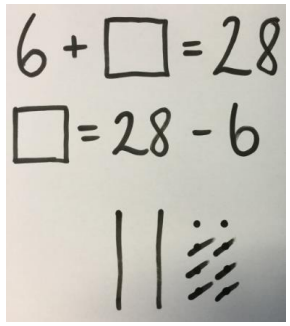
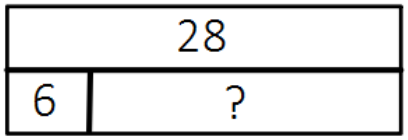
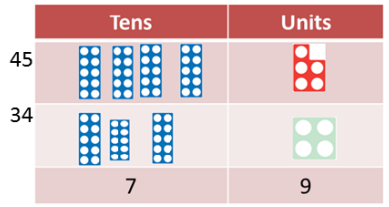
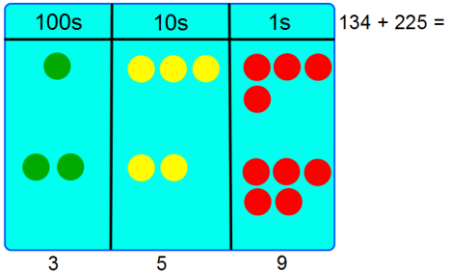
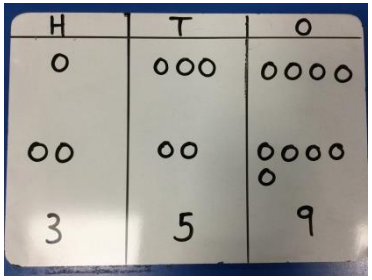
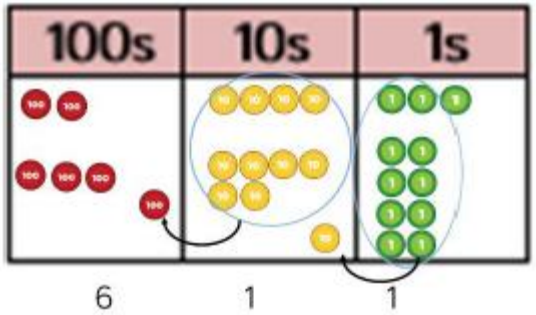
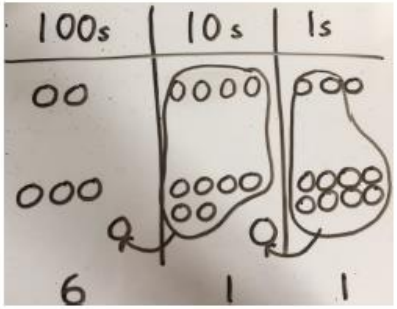
		Use a number line to support bridging ten. 	 50 + 11 = 61
Add a two digit number and tens	 25 + 10 = 35 Explore that the ones digit does not change		27 + 10 = 37 27 + 20 = 47 27 + □ = 57
Add three one digit numbers	 4 + 7 + 6 = 17 Put the 4 and 6 together to make 10. Add on the 7.	  Regroup and draw representation. 	 Combine the two numbers that make/bridge ten then add on the third.

Using the inverse to find the missing number. Difference	$6 + \square = 28$ $\square = 28 - 6$  	$6 + \square = 28$   <u>Bar Model:</u>  $\square = 28 - 6$	$6 + \boxed{22} = 28$ $\boxed{22} = 28 - 6$

YEAR 3 ADDITION

Addition Year 3	Concrete	Pictorial	Abstract
Column addition with no regrouping Numbers up to three digits.	Add together the ones first, then the tens.  		134 225 + 359
Column addition with regrouping Numbers up to three digits.	When there are 10 ones in the 1s column we regroup for 1 ten, when there are 10 tens in the 10s column we regroup for 1 hundred. 	Children to represent the counters in a place value chart circling when they regroup. 	243 368+ 611 1 1

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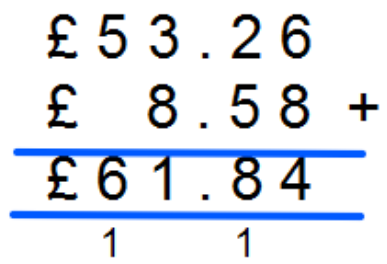
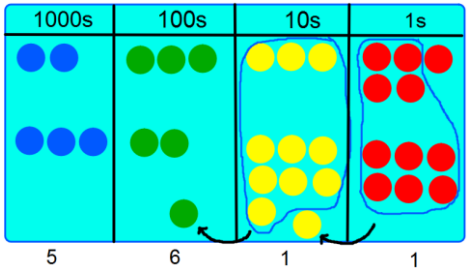
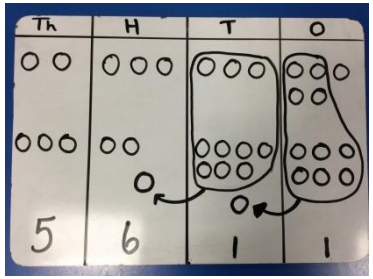
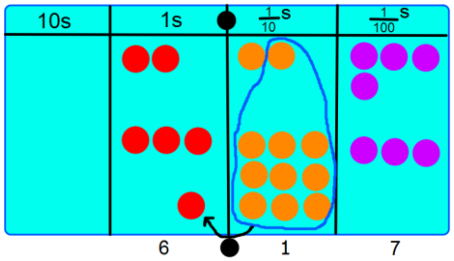
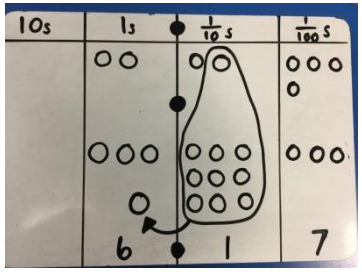
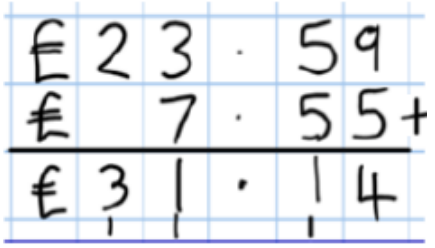
			Measure: 

YEAR 4 YEAR 5 YEAR 6 ADDITION

Addition Year 4, 5 and 6	Concrete	Pictorial	Abstract
Year 4: Column method regrouping (up to 4 digits)	When there are 10 ones in the 1s column we regroup for 1 ten, when there are 10 tens in the 10s column we regroup for 1 hundred. When there are 10 hundreds in the 100s column we regroup for 1 thousand. 		2335 3276 + 5611 1 1
Year 5: Column method regrouping (with more than 4 digits) Add decimals with 2 decimal places, including money	As year 4, including numbers with more than 4 digits.  When there are 10 tenths in the 1/10s column we regroup 10 tenths for 1 one, when there are 10 tens in the 10s column we regroup for 1 hundred. When there are 10 hundreds in the 100s column we regroup for 1 thousand.		2.24 3.93 + 6.17 1 

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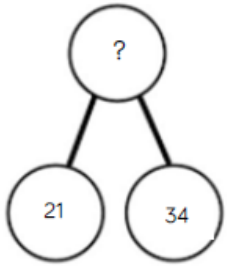
Year 6: Add several numbers with increasing complexity. Including adding money, measure and decimals with different decimal points.	Use place value counters as above if still necessary.	Use jottings as above if still necessary.	81059 20551 5301 3668 + 110579 1 1 1 1 Insert zeros for place holders. 23·361 9·080 59·770 + 1·300 93·511 2 1 2

Conceptual variation; different ways to ask children to solve 21 + 34



?	
21	34

Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

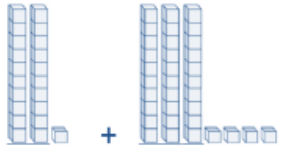
21 + 34 = 55. Prove it

21
+34
___

21 + 34 =

☐ = 21 + 34

Calculate the sum of twenty-one and thirty-four.

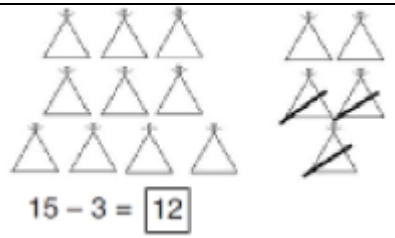
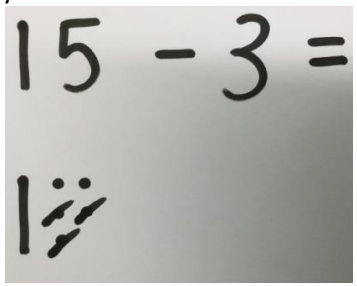
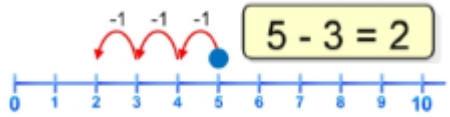


Missing digit problems:

10s	1s
10 10	1
10 10 10	?
?	5

Subtraction	Concrete	Pictorial	Abstract

YEAR 1 SUBTRACTION

Subtraction Year 1	Concrete	Pictorial	Abstract
Taking away ones.	Use physical objects, counters, diennes, cubes etc. to show how objects can be taken away. 	 Cross out drawn objects to show what has been taken away. 	7 – 4 = 3 16 – 9 = 7
Counting back.	 Move the beads along the bead string as you count backwards in ones.  Move objects away from the group, counting backwards	 Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?

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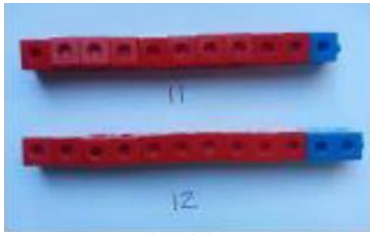
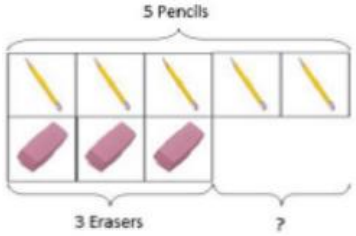
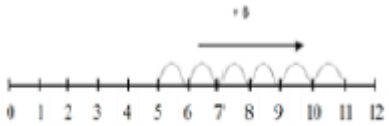
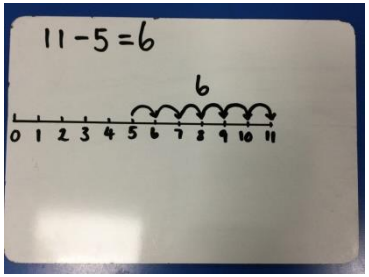
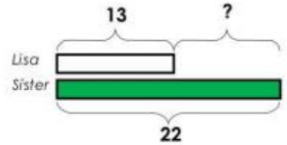
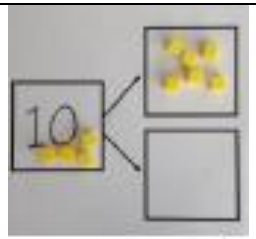
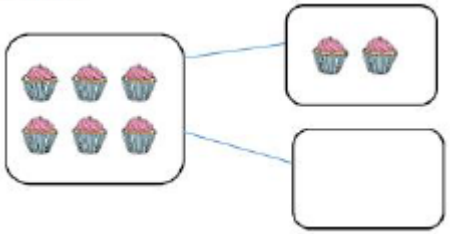
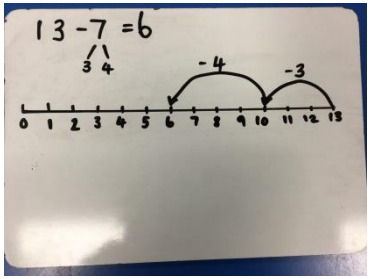
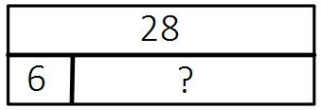
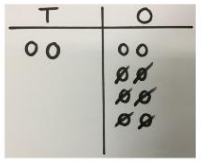
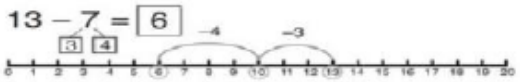
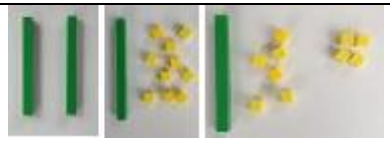
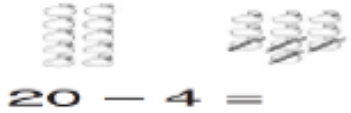
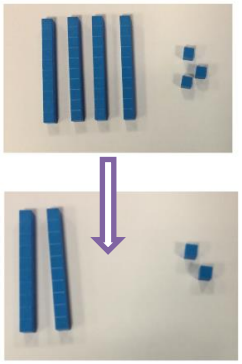
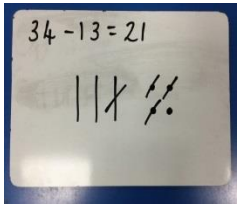
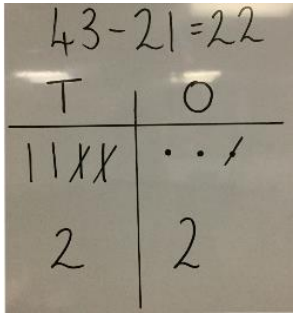
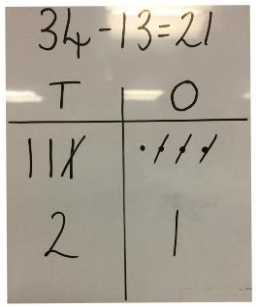
Find the difference	Compare objects and amounts.  Use cubes to build towers or make bars to find the difference.  Use basic bar models with items to find the difference.	Count on using a number line to find the difference. +6   Draw bars to find the difference between 2 numbers. **Comparison Bar Models** *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  	Hannah has 12 grapes and her sister has 5. How many more does Hannah have than her sister? Helen has 11 plums and her sister has 3. Find the difference between the number of plums.
Part Part Whole model.	 Link to addition. Use PPW model to model the inverse.	Use pictorial representations to show the part.	Move to using numbers within the part part whole model.

	If 10 is the whole and 6 is one of the parts, what is the other number? 10 – 6 = 4		
Make 10.	 14 – 9 = Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5.	Jump back 3 first, then another 4. Use ten as the stopping point. Children must be encouraged to draw a number line and be able to interpret one. 	16 – 8 How many do we take off first to get to 10? How many left to take off?

		<u>Bar Model</u> 28- 6 = ☐    	

YEAR 2 SUBTRACTION

Subtraction Year 2	Concrete	Pictorial	Abstract
Regroup a ten into ten ones.	 20 – 4 = 16 Change a ten into ten ones.		20 – 4 = 16
Subtracting without regrouping.	 43-21 = 22 Use Dienes to show how to partition the number when subtracting without regrouping. 34 – 13 = 21 	  Children draw representations of Dienes and cross off.  	Children to be supported in their understanding by using a formal column method. 43 – 21 = 22 34 – 13 = 21 43 − 21 = 22 34 − 13 = 21

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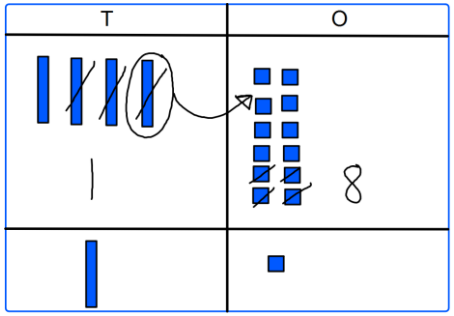
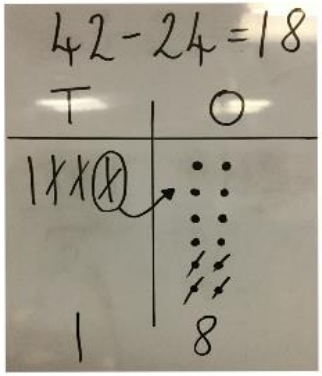
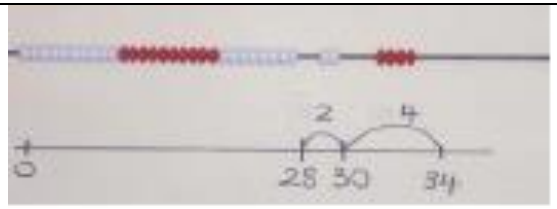
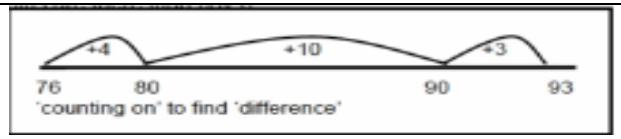
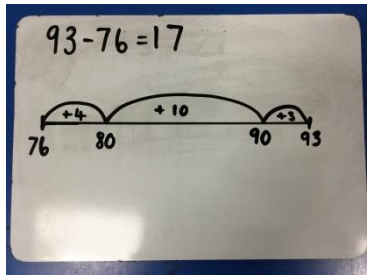
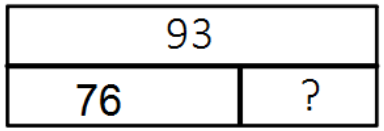
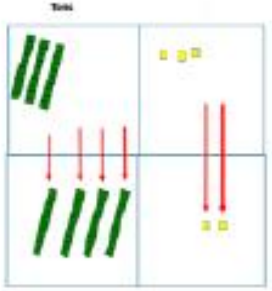
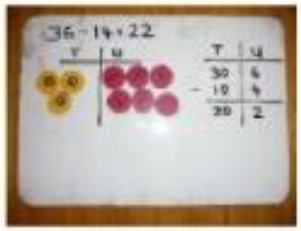
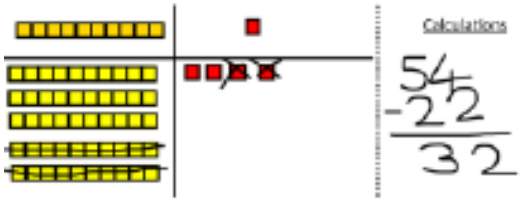
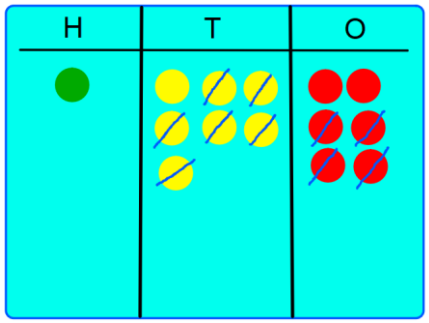
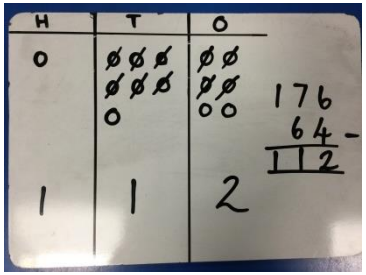
Subtracting TO –TO with regrouping	42 – 24 = 18 Start with the ones, can I take away 2 from 2 ones easily? No, I need to exchange one of my tens for ten ones.  Now I can subtract my ones (remove/cross out cubes from the place value mat). Now look at the tens, can I take away 2 tens from the 3 tens easily? Yes.	 	3 1 42 24 - 18
Make ten strategy. Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.	 34 – 28 = Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to the next ten and then the rest.  	93 – 76 =

		Bar Model: 93- 76 =  	

YEAR 3 SUBTRACTION

Subtraction Year 3	Concrete	Pictorial	Abstract
Column subtraction without regrouping.	75 – 42 =  Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first. 	  176 - 64 = 176 64 - 112 Draw the base 10 or place value counters alongside the written calculation to help show working.  Children could rub out jottings instead of crossing them out.	32 12 - 20 345 123 - 222

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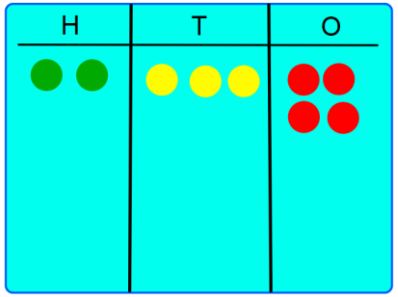
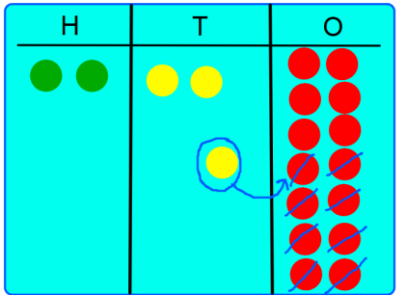
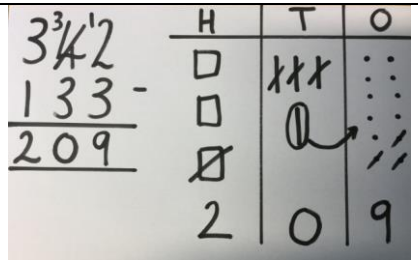
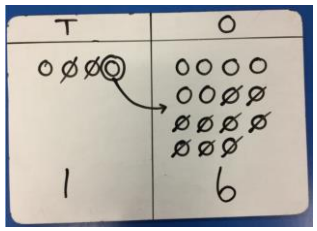
Column subtraction with regrouping.	Use base 10 to start with before moving onto place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters.  234 - 88 = 234 88 - Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.  234 - 88 = 21 234 88 - 6 Now I can subtract my ones (remove counters from the place value mat). Now look at the tens, can I take away 8 from the tens easily? I need to exchange one hundred for ten tens.	 Children may draw base ten or PV counters and cross off.  Draw the counters onto a place value grid and show what you have taken away by crossing out or rubbing out as well as clearly showing the exchanges you make.	Column Subtraction 7 1 836 254 - 582 Measure: £ 4 2 . 3 4 £ 6 . 1 6 - £ 3 6 . 1 8

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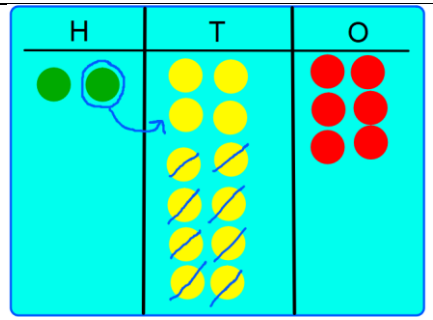
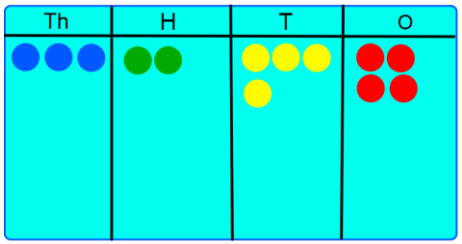
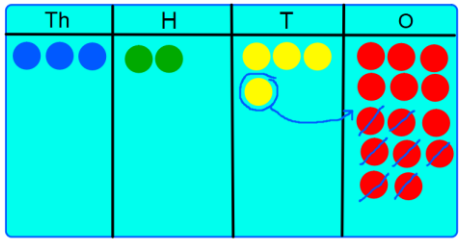
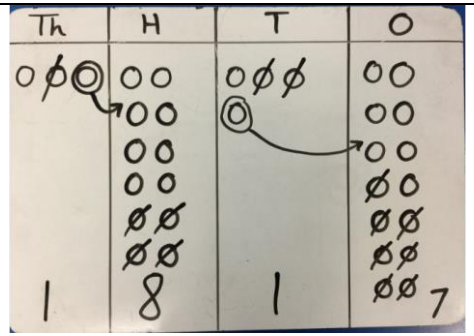
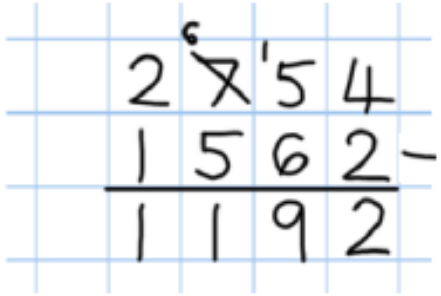
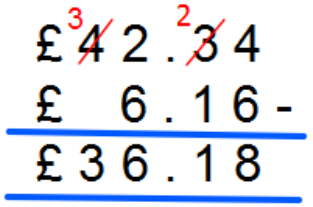
	 234 - 88 = 1 2 1 1 2 3 4 88 - 146 Now I can take away eight tens and complete my subtraction. Show the children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.		

YEAR 4 YEAR 5 YEAR 6 SUBTRACTION

Subtraction Year 4, 5 and 6	Concrete	Pictorial	Abstract
Year 4 to subtract with up to 4 digits. Introduce decimal subtraction through context of money.	 3244 1427 - Start with the ones, can I take away 7 from 4 ones easily? I need to exchange one of my tens for ten ones.  3244 1427 - 7 Now I can subtract my ones (remove counters from the place value mat). Now look at the tens, can I take away 2 tens from the 3 tens easily? Yes.		 

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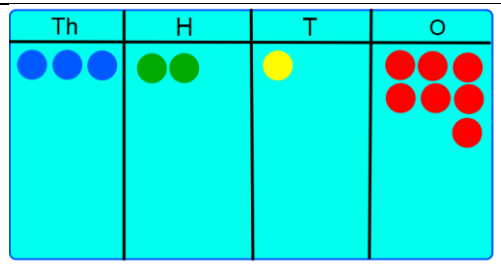
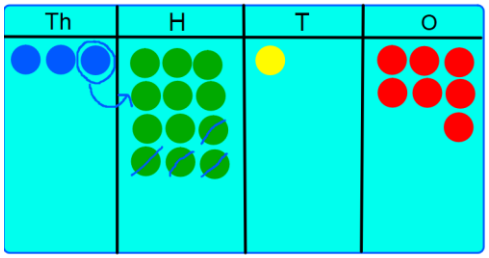
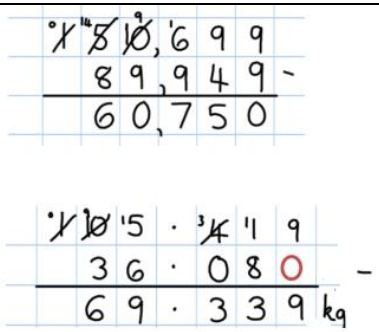
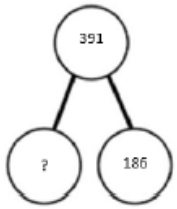
	 3244 1427 - 17 Now look at the hundreds, can I take away 4 hundred from 2 hundred? I need to exchange one of my thousands for 10 hundreds.  3244 1427 - 1817 Now I can complete my calculation.		
Year 5 – Subtract with at least 4 digits, including money and measures.	See Year 4.	See Year 4.	3 1 0 6 2 1 2 8 – 2 8,9 2 8 Use zeros for place-holders. 6 9 · 0 3 7 2 · 5 – 6 7 9 6 · 5

Year 6 – Subtract with increasingly large and more complex numbers and decimal values.			

Conceptual variation; different ways to ask children to solve 391 - 186



391	
186	?

Raj spent £391, Timmy spent £186.
How much more did Raj spend?

Calculate the difference between 391 and 186.

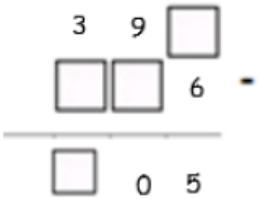
□ = 391 – 186

391

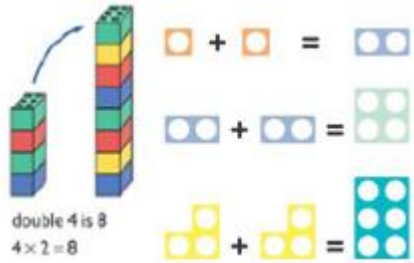
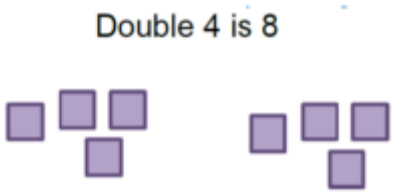
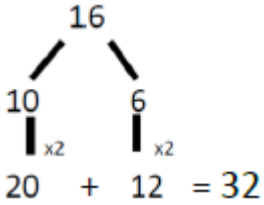
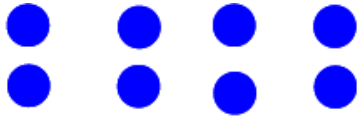
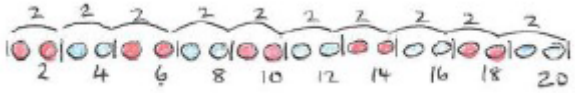
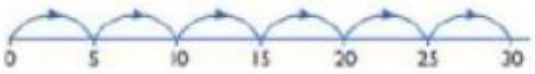
186 -

What is 186 less than 391?

Missing digit calculations



YEAR 1 MULTIPLICATION

Multiplication Year 1	Concrete	Pictorial	Abstract
Doubling	Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling. 	Draw pictures to show how to double numbers.  Children make representations to show counting in multiples.	Draw pictures to show how to double numbers. 
Counting in multiples /repeating groups	  Count in multiples supported by concrete objects in equal groups.	 Children make representations to show counting in multiples.    Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 24, 30

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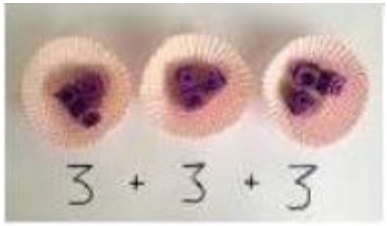
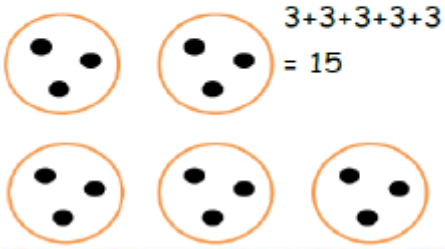
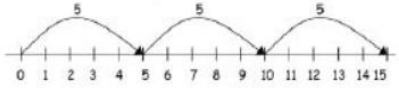
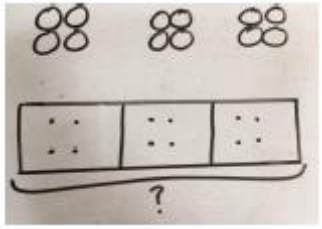
Repeated addition	 Use different objects to add equal groups.  	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there? 2 add 2 add 2 equals 6  There are 3 sweets in one bag. How many sweets are in 5 bags altogether?   5 + 5 + 5 = 15 Use pictorial including number lines to solve problems.  Children could represent the practical resources in a picture or use a bar model.	Write addition sentences to describe objects and pictures. 

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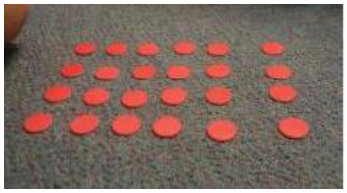
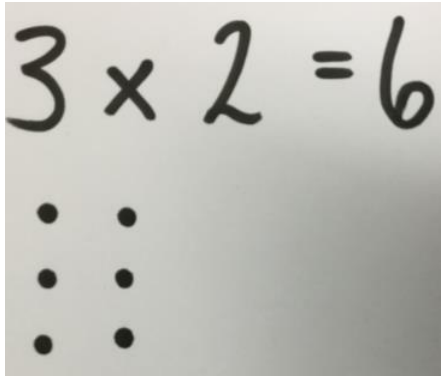
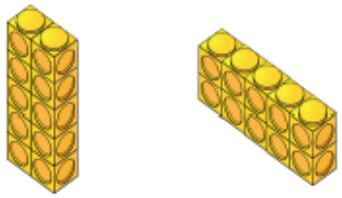
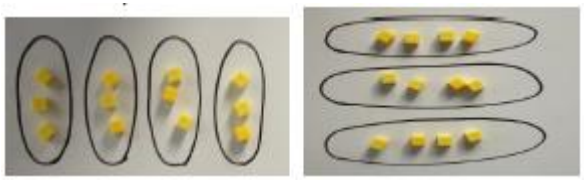
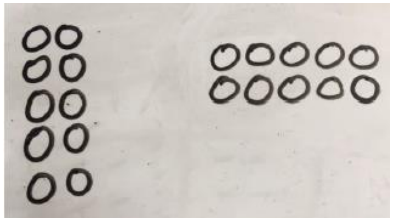
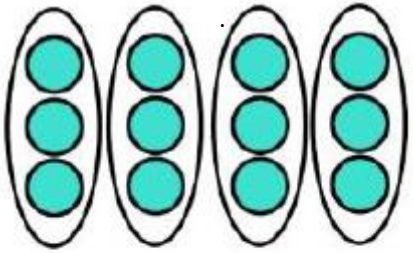
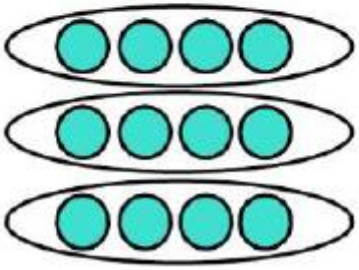
Understanding arrays	 	Create arrays using counters/cubes/dienes/ base 10 to show multiplication sentences.	Children to represent the arrays pictorially to show their understanding. 	3 x 2 = 6 2 x 5 = 10

YEAR 2 MULTIPLICATION

Multiplication Year 2	Concrete	Pictorial	Abstract
Arrays showing commutivity	$2 \times 5 = 5 \times 2$  2 lots of 5 5 lots of 2 Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of multiplication does not affect the answer. 	 Use representations of arrays to show different calculations and explore commutativity.  	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$

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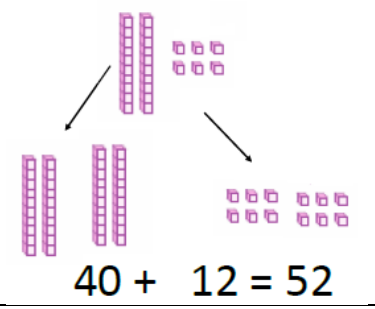
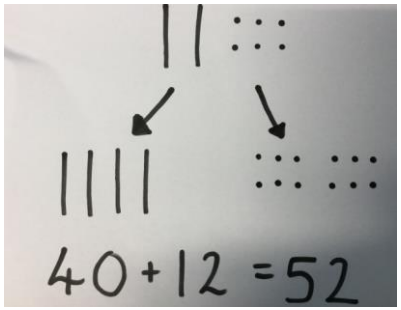
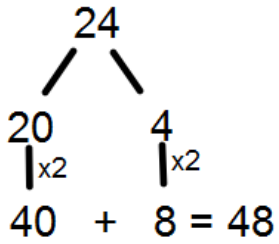
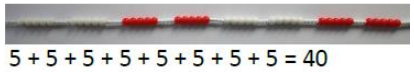
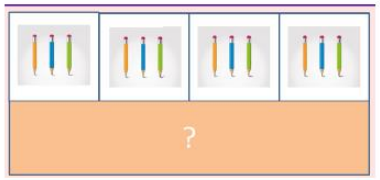
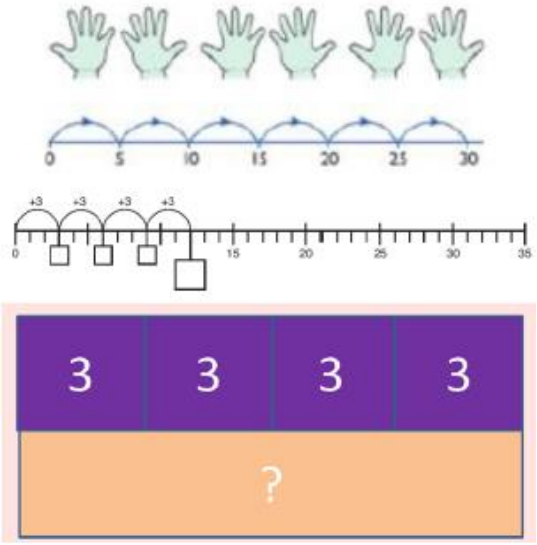
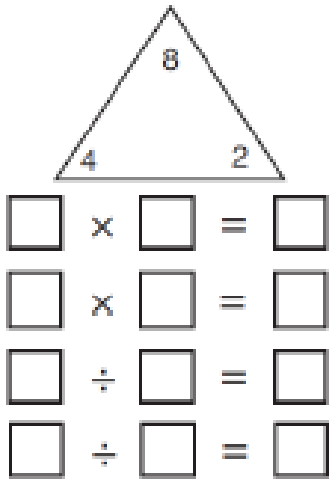
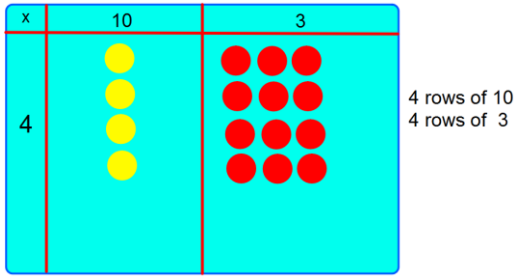
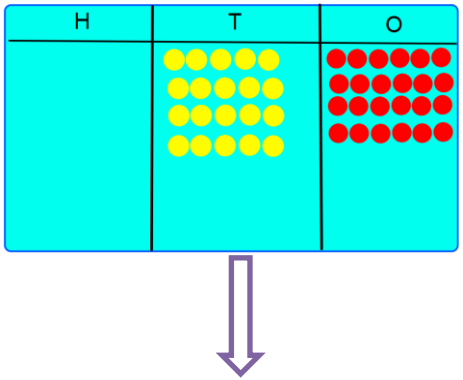
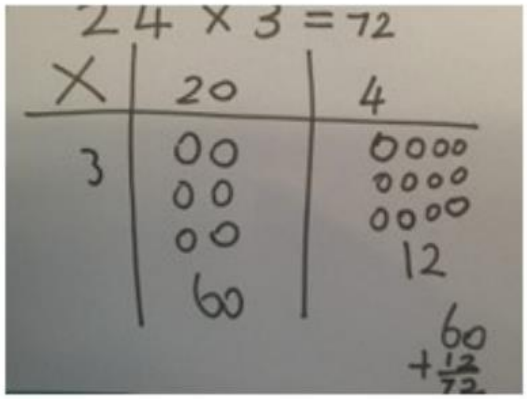
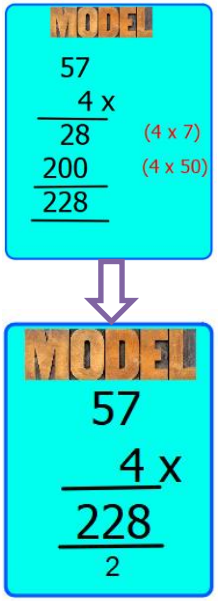
Doubling	Model doubling using diennes and place value counters. Eg. 26 x 2 =  	Draw pictures and representations to show how to double numbers.  	Partition a number and then double each part before recombining it back together/ 
Counting in multiples of 2, 3, 4, 5, 10 from 0	Count the groups as children are counting in the multiples. You could use bar models.     	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.  	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 $4 \times 3 = \square$

Using the inverse *This should be taught alongside division, so pupils learn how they work alongside each other.*			2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8÷ 2 Show all 8 related fact family sentences.

YEAR 3 MULTIPLICATION

Multiplication Year 3	Concrete	Pictorial	Abstract
Grid method	Show the links with arrays first to introduce the grid method. 13 x 4 =  This could also be represented using base ten. 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. 56 x 4 =  	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.  	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. | × | 30 | 5 | | --- | --- | --- | | 7 | 210 | 35 | 210 + 35 = 245 If appropriate, NC states that Year 3 should be introduced to a formal written method of short multiplication (TO x O). Expanded Multiplication:  The children could move onto using short multiplication for TO x O

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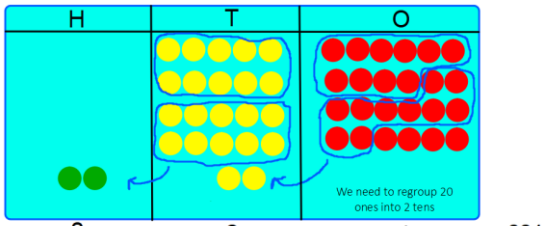
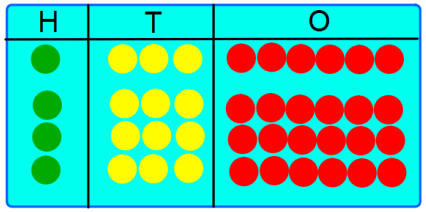
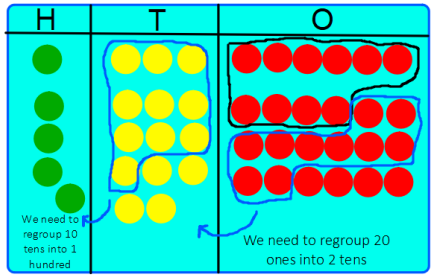
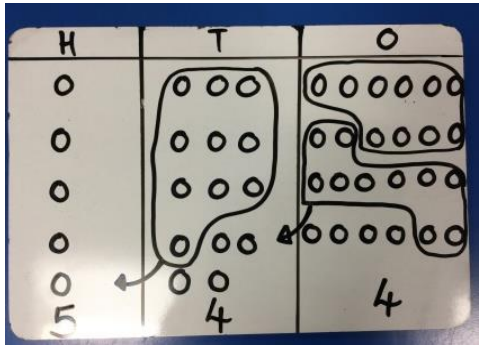
	56 x 4 = Do you need to regroup?  We need to regroup 2 tens into 2 hundreds		

YEAR 4 YEAR 5 YEAR 6 MULTIPLICATION

Multiplication Year 4, 5 and 6	Concrete	Pictorial	Abstract
Year 4: Review grid method moving on to 3 digit numbers by 1 digit if children require visual partitioning of digits.	Move onto place value counters to show how we are finding groups of a number. 136 x 4 = We are multiplying by 4 so we need 4 rows. 136 x 4 = Create 4 groups of 136.  Do you need to regroup?  5 4 4 Add up each column, starting with the ones regrouping where needed.	 	234 x 6 = X | 200 | 30 | 4 6 | 1200 | 180 | 24 1200 180 24+ 1404 1

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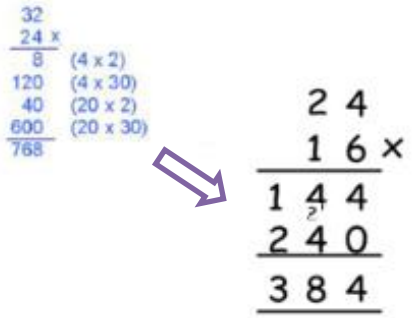
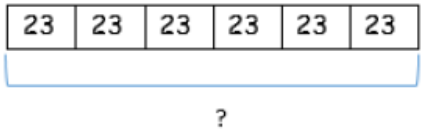
Year 4: Short Multiplication Numbers up to 3 digits.	Children can continue to be supported by place value counters at this stage of multiplication. See above.	The grid method may be used to show how this relates to a formal written method. | x	300	20	7
---	---	---	---
4	1200	80	28		MODEL 327 4 x 28 80 1200 1308 1 MODEL 327 4 x 1308 1 2 Short Multiplication
Year 5 and Year 6 ThHTO x O ThHTO x TO	Children can continue to be supported by place value counters if necessary.	See above.	MODEL 2327 5 x 11635 1 1 3 Short Multiplication

		When children start to multiply 3 digit by 3 digit and 4 digit by 2 digit etc., they should be confident with the abstract.	In year 5, children are expected to be able to use long multiplication for two digit numbers. 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.  In Year 6, children are expected to multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

			2741 × 66 = 164460 + 16446 = 180906 (11)
Year 6:			Children are required to multiply one-digit numbers with up to two decimal places by whole numbers (NC-Fractions including decimals) Remind children that the single digit belongs in the units column. Line up the decimal points in the question and in the answer. 3·19 × 8 = 25·52 (1 7) 2.41 × 6 = 14.46 (2)

Conceptual variation; different ways to ask children to solve 6 × 23



Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

Find the product of 6 and 23

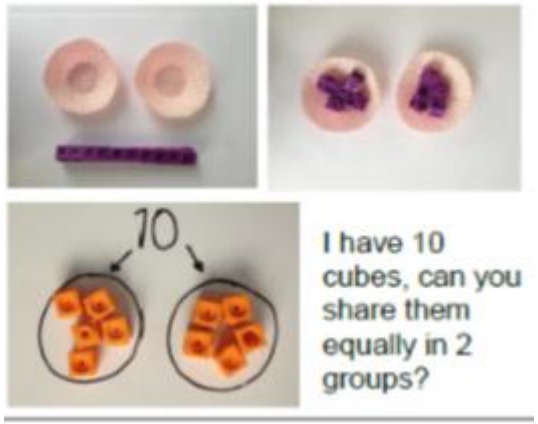
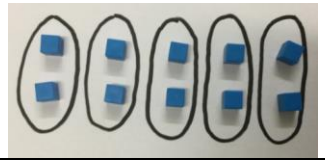
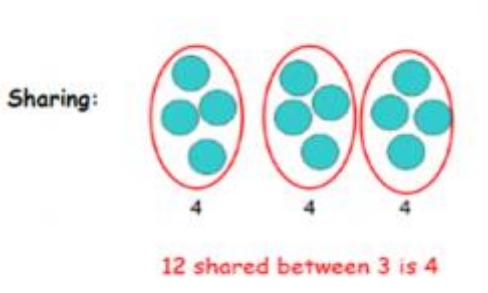
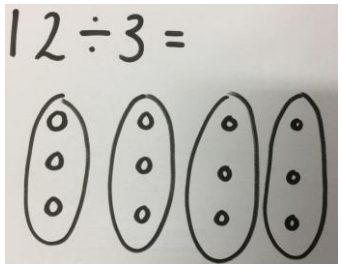
6 × 23 =

☐ = 6 × 23

6 × 23 = ___ 23 × 6 = ___

What is the calculation?
What is the product?

YEAR 1 DIVISION

Division Year 1	Concrete	Pictorial	Abstract
Sharing objects into group Division as grouping	<u>Sharing:</u>  <u>Grouping</u>: I have 10 cubes. Can you group them into 2s? 	<u>Sharing:</u>  <u>Grouping:</u>  	<u>Sharing:</u> Share 9 buns between three people. 9 ÷ 3 = 3 <u>Grouping:</u> Divide 15 into groups of 5. How many groups are there?

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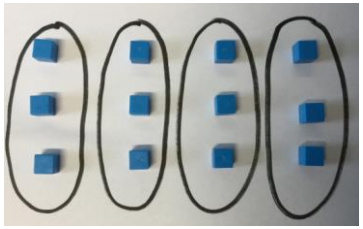
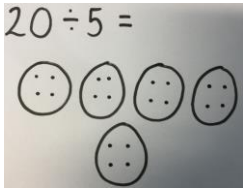
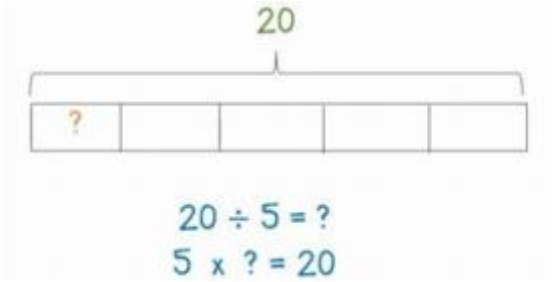
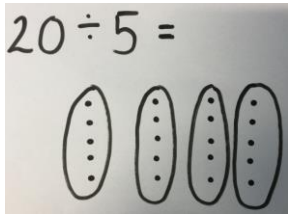
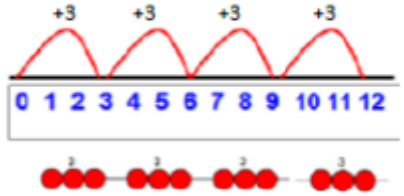
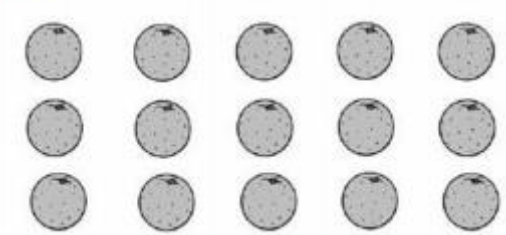
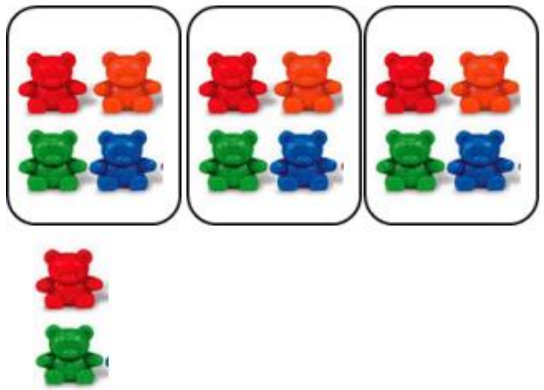
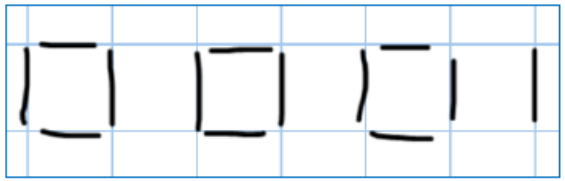
YEAR 2 DIVISION

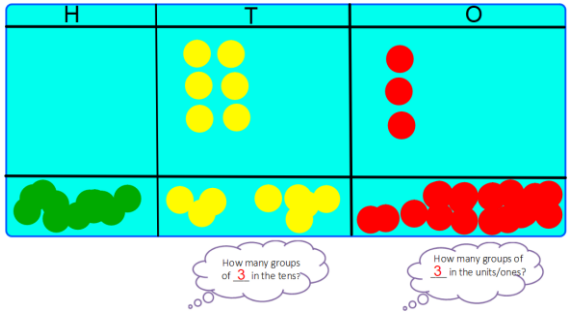
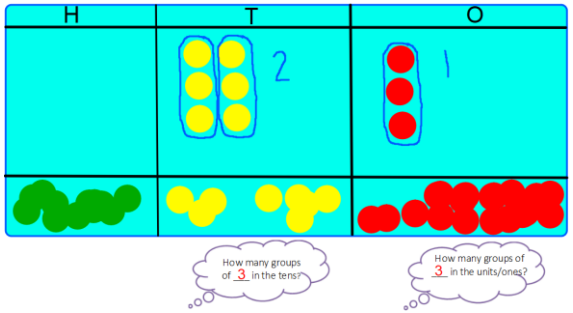
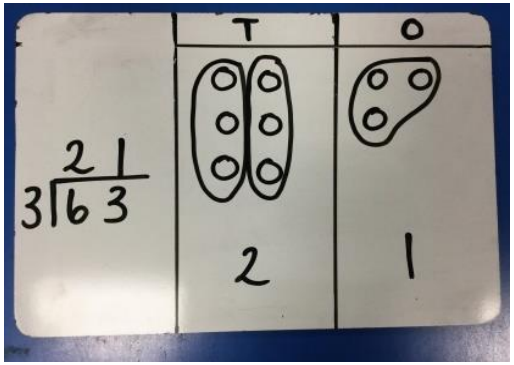
Division Year 2	Concrete	Pictorial	Abstract
Division as sharing and grouping	Sharing:  12 ÷ 3 = 4 Grouping:  12 ÷ 3 = 4	Sharing:  Bar Model:  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.	Sharing: 28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group? Grouping: Divide 28 into groups of 7. How many groups are there?

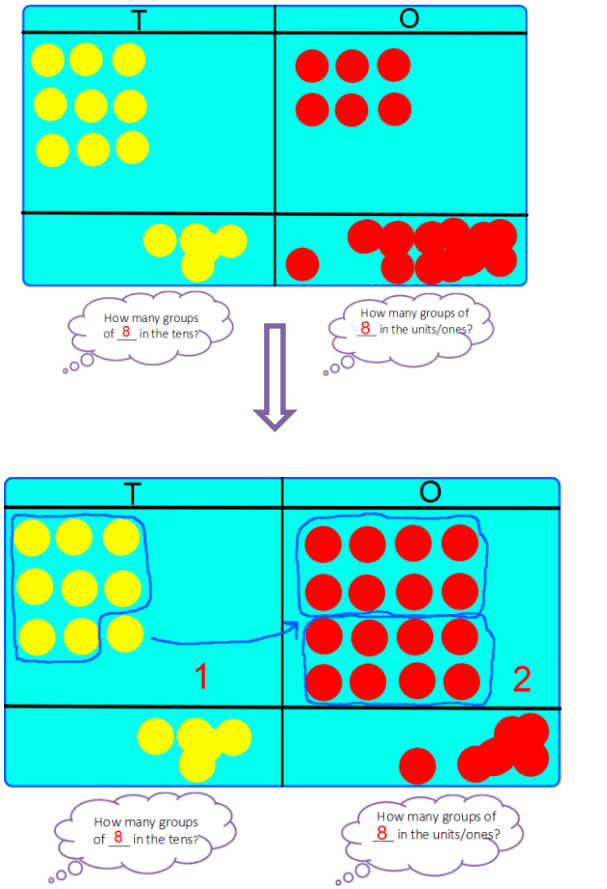
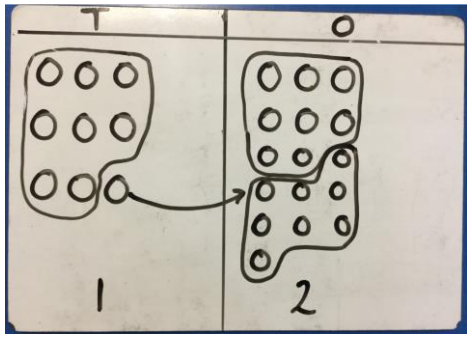
		Grouping:  Use number lines for grouping  12 ÷ 3 = 4	

YEAR 3 DIVISION

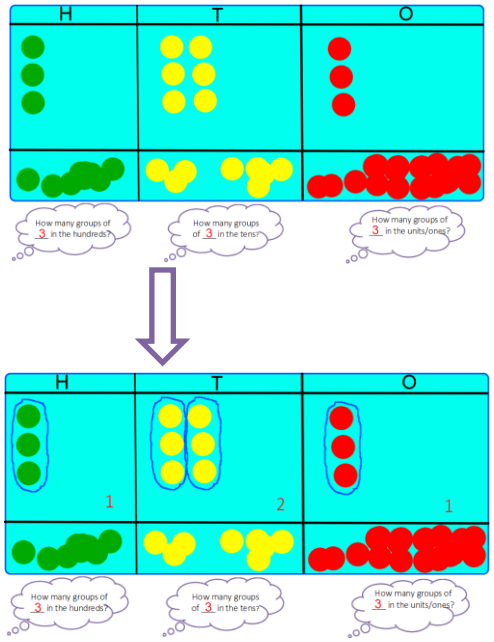
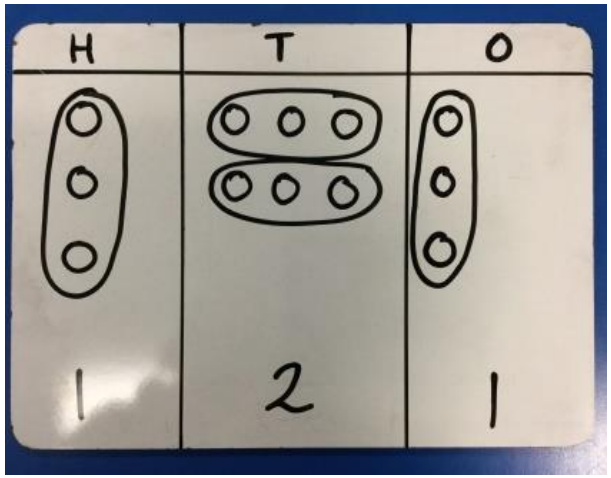
Division Year 3	Concrete	Pictorial	Abstract
Division with arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the array into groups to make multiplication and division sentences 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

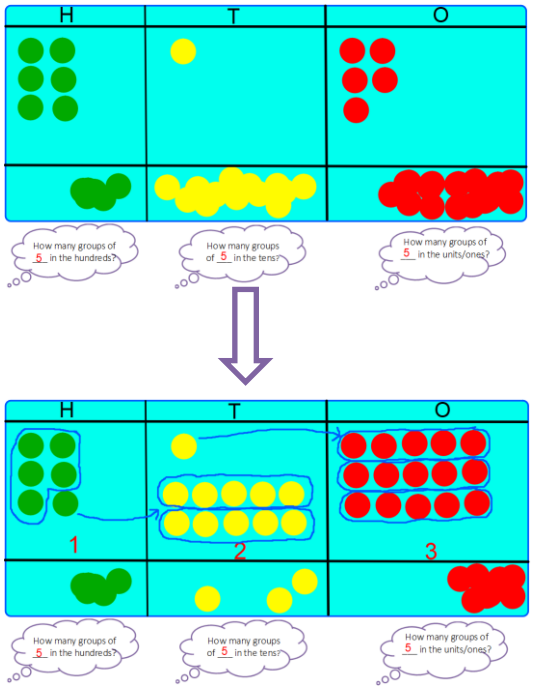
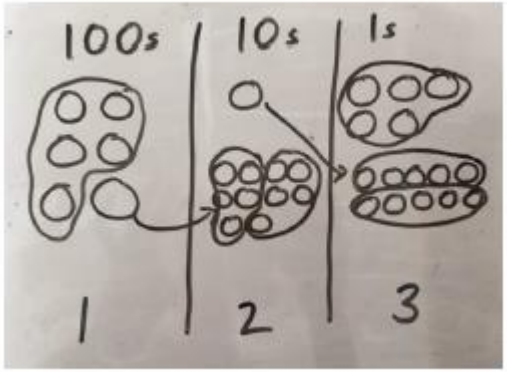
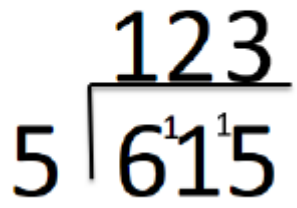
Division using remainders	14 ÷ 3 = Divide objects between groups and see how much is left over  **2d ÷ 1d with remainders** using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Draw dots and group them to divide an amount and clearly show a remainder.  Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	Complete written divisions and show the remainder using r.  13 ÷ 4 – 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over'

Introducing Short division (no remainders) Grouping with place value counters (no regrouping)	Use place value counters to introduce dividing using short division. Where appropriate children to record their response in the short division method. 63 ÷ 3 =  ⇩  $\begin{array}{r} 21 \\ 3\overline{)63} \end{array}$	 	$\begin{array}{r} 21 \\ 4\overline{)84} \end{array}$ $\begin{array}{r} 43 \\ 2\overline{)86} \end{array}$ $\begin{array}{r} 32 \\ 3\overline{)96} \end{array}$

Introducing Short division Grouping with place value counters (regrouping)	96 ÷ 8 =  We need to exchange 1 ten from the tens into 10 ones. $8\overline{)9^{1}6}$ 12	 Encourage the children to record their answer in the short division format.	$3\overline{)4^{1}2}$ 14 $4\overline{)5^{1}6}$ 14 $6\overline{)9^{3}6}$ 16

YEAR 4 YEAR 5 YEAR 6 DIVISION

Division Year 4, 5 and 6	Concrete	Pictorial	Abstract
Divide at least 3 digit numbers by 1 digit. (no regrouping) Short Division	Use place value counters to introduce dividing 3 digit numbers using short division. Alongside using the place value counters, children need to record their answer in short division 363 ÷ 3 =  363 ÷ 3 = 121 $3\overline{)363}$ = 121	Encourage the children to record their answer in the short division format.  	$4\overline{)844}$ = 211 $2\overline{)642}$ = 321 $3\overline{)966}$ = 322

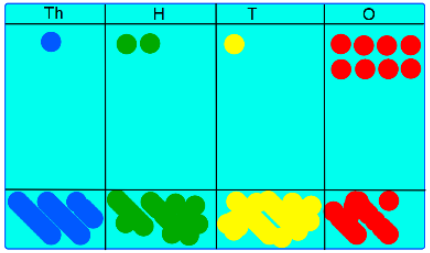
Divide at least 3 digit numbers by 1 digit. (regrouping) Short Division	615 ÷ 5 =  Encourage the children to record their short division calculation alongside their use of place value counters.	Represent the place value counters pictorially.  Encourage the children to record their answer in the short division format.	Children to the calculation using the short division scaffold. 

Year 6

Divide at least 4 digit numbers by 1 digit. (regrouping)

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division

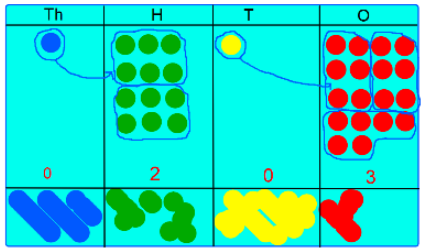
Short Division



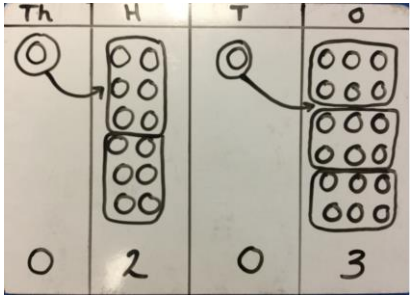
How many groups of 6 in the hundreds?

How many groups of 6 in the tens?

How many groups of 6 in the units/ones?



$$6\overline{)1^{1}2\ 1^{1}8}\qquad 0\ 2\ 0\ 3$$



Encourage the children to record their answer in the short division format.

$$6\overline{)1^{1}2\ 1^{1}8}\qquad 0\ 2\ 0\ 3$$

$$11\overline{)4\ 9\ 6}\qquad 4\ 5\ r1$$

Answer $45\frac{1}{11}$

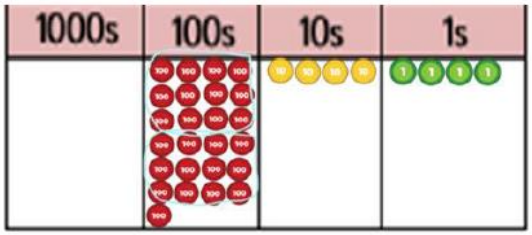
Long division

(Year 6)

Long division using place value counters

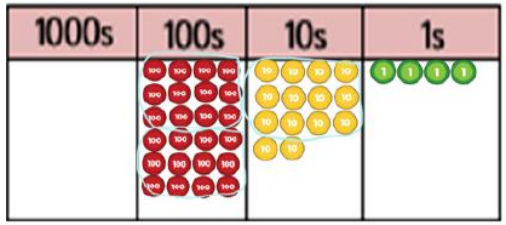
2544 ÷ 12

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



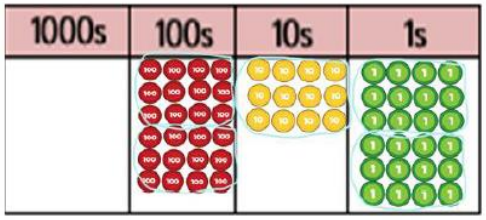
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

```
  02
12|2544
  24
  --
   1
```



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

```
  021
12|2544
  24
  --
  14
  12
  --
   2
```

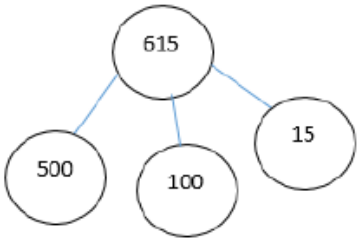


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

```
  0212
12|2544
  24
  --
  14
  12
  --
  24
  24
  --
   0
```

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide 615 by 5 without using short division?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$5 \overline{)615}$

615 ÷ 5 =

☐ = 615 ÷ 5

What is the calculation?
What is the answer?

MathsHUBS

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