Maths Calculation Policy

Amended: ***Autumn 2022***

Adopted by Learning & Teaching Committee on behalf of the Governing body: ***Autumn 2022***

This calculation policy sets out the methods used to help our pupils with calculations and has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It is also designed to give pupils a consistent and smooth progression of learning calculations across the school. Pupils are taught strategies to develop and strengthen their mental agility on a daily basis. They also need to be able to apply written calculation skills in order to:

- represent practical work
- support, record and explain mental calculation
- keep track of steps in longer tasks
- work out calculations that are too difficult to complete mentally

The Calculation Policy shows methods that pupils will be taught within their respective year group. It is shown in teaching order. Children should be confident in choosing and using a strategy that they know will get them to the correct answer as efficiently as possible; pupils are free to choose their preferred method to solve calculations.

Concrete, Pictorial, Abstract (CPA):

A key principle behind the Singapore Maths textbooks and Maths Mastery is based on the concrete, pictorial and abstract approach. Pupils are first introduced to an idea or skill by acting it out with real objects (a hands-on approach). Pupils then are moved onto the pictorial stage, where pupils are encouraged to relate the concrete understanding to pictorial representations. The final abstract stage is a chance for pupils to represent problems by using mathematical notation. Lessons will move children to work in the abstract quickly, but ensure they fully understand the underlying concepts through use of concrete and pictorial resources.

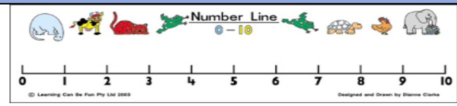
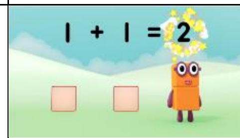
Whilst this calculation policy aims to show the CPA approach to the different calculations, it is not always noted further up the year groups. However, it is expected that the CPA approach is used continuously in all new learning and calculations particularly when used to explore, explain and reason.

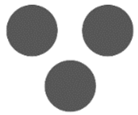
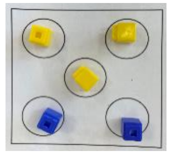
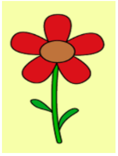
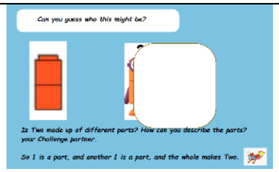
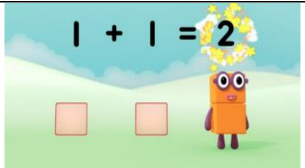
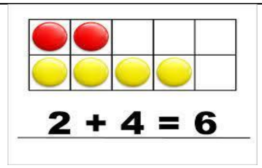
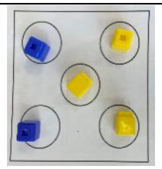
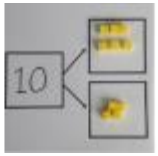
Sources

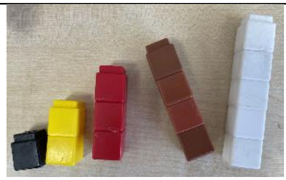
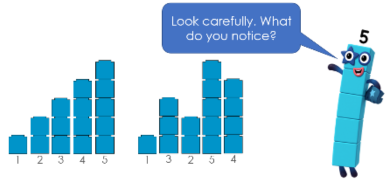
This policy provides used examples from our school's current practice. However, this is a working document that will be revised and amended as necessary. Some examples and materials have been adapted from other sources including White Rose, Maths Hub, NCETM, Maths No Problem! and Power Maths.

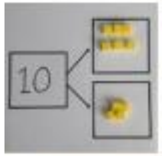
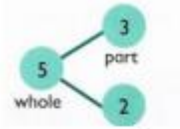
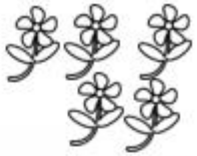
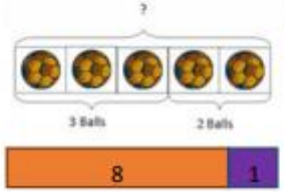
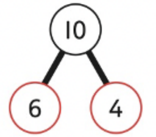
Addition Overview						
YR	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Develop cardinality by understanding that the last number in a count tells us how many in a set of objects.	Combining two parts to make a whole Part-part whole model	Adding multiples of ten	Column method without regrouping	Column method without regrouping	Column method with decimals	Column method with decimals
Using fingers to show quickest way to make numbers 5-10 as '5 and -------more'.	Starting at the bigger number and counting on	Use known number facts	Column method with regrouping	Column method with regrouping		
Use perceptual subitising skills to recognise numbers within numbers.	Regrouping to make 10	Add three 1 digit numbers				
Understand that a whole is made up of smaller parts.	Represent and use number bonds and related subtraction facts within 20	Add a 2 digit number and ones				
Automatically recall number bonds for numbers 0-10.	Fact families	Add a 2 digit number and tens				
Explore the composition of numbers to 10 by investigating part-part-whole relations.	Understanding teen numbers as a complete 10 and some more	Add two 2 digit numbers				
Use 'staircase model' to understand that numbers get bigger as we add one more.	Addition of one-digit and two-digit numbers to 20 including 0.	Column method without regrouping				
Develop cardinality by understanding that the last number		Column method with regrouping				

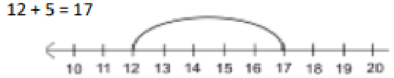
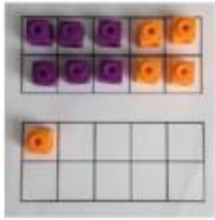
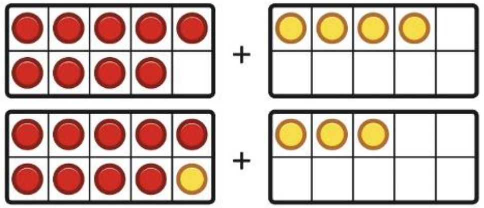
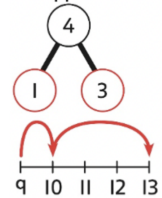
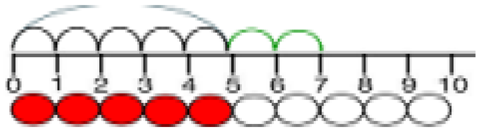
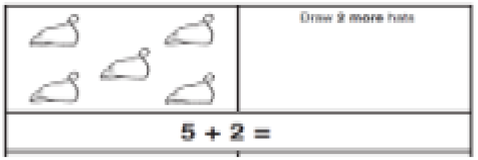
in a count tells us how many in a set of objects.						
Using fingers to show quickest way to make numbers 5-10 as ‘5 and -------more’.						
Use perceptual subitising skills to recognise numbers within numbers.						

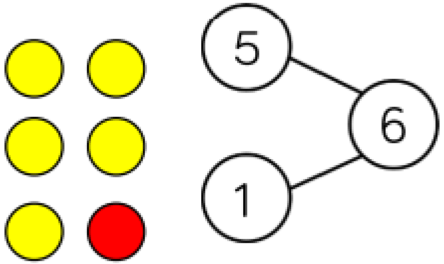
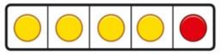
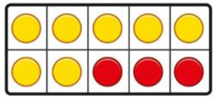
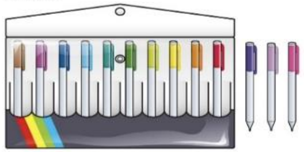
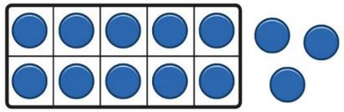
Addition YR			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Develop cardinality by understanding that the last number in a count tells us how many in a set of objects.	 Children have opportunity to make counting collections using a variety of resources.	 Improve accuracy in counting by pointing to each object or using a counting wand, lining up objects and saying how much in the set.	 Apply their counting knowledge to numberlines to show an awareness of how numbers are represented with numerals.
Using fingers to show quickest way to make numbers 5-10 as ‘5 and ------- more’.	 Use their fingers to represent numbers and amounts in games and activities. Developing finger gnosis by showing fingers above head so not counting fingers first.	 Represent how groups of numbers combine using their fingers. Eg. “5 and 3 more is 8 altogether.”	  Introduced to number sentences alongside concrete resources and using number flashcards.

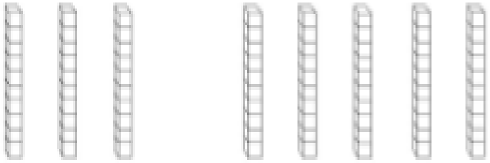
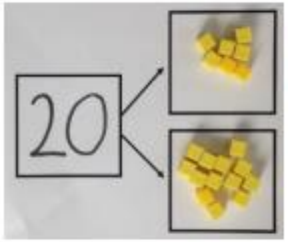
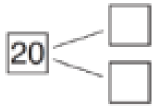
Use perceptual subitising skills to recognise numbers within numbers.	 Learn how to recognise amounts when represented visually (rather than by counting) know that amounts can be represented in more than one way.	 Larger numbers are learnt by recognising groups of numbers within that pattern. For example 6 is made of a 3 and a 3.	 Children record numbers within numbers to make a whole amount using number cards, cubes or writing on whiteboards.
Understand that a whole is made up of smaller parts.	  Children are introduced to language and images of whole and part.	 Able to recognise numbers are can be made of different parts, using cubes and visual representations to explain.	 Use generalisations to explain which parts make whole numbers from 1-10.
Automatically recall number bonds for numbers 0-10.	 Use knowledge of number composition to find different parts of a whole.	 Use fingers to show how numbers can be made of '5 and a bit' and begin recall of number bonds.	 Use ten frame and die frames to represent number bonds as two parts of the whole.
Explore the composition of numbers to 10 by investigating part-part-whole relations.	 Select different resources from environment to make representations of numbers and amounts. Find different ways to represent an amount.	  Show how many more need to be added to an amount to make a whole on rekenrek. Use different coloured counters to show different ways to make 5 on a die frame.	 Introduce children to part part whole model using generalisations such as '5 is made from 2 and 3. 3 and 2 make 5 altogether.' 'Or 6 is a part, 4 is a part 10 is the whole.'

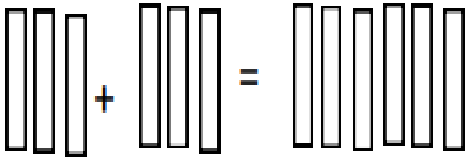
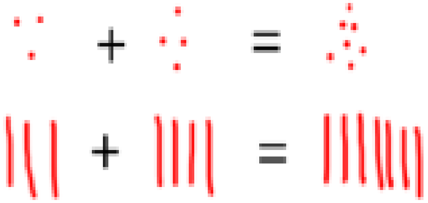
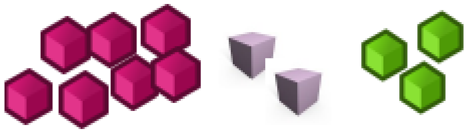
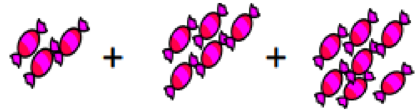
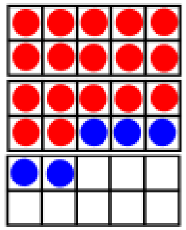
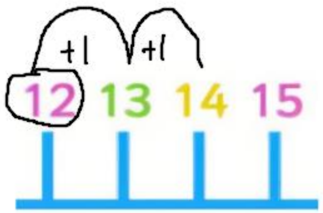
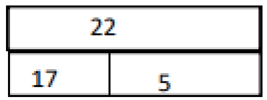
Use ‘staircase model’ to understand that numbers get bigger as we add one more.	 Use cubes to make staircase patterns of numbers 1-10 recognising each tower of cubes gets bigger.	 Recognise which amounts are ‘more than’ or ‘fewer than’ using visual representations. Can spot if staircase pattern is in wrong order or missing a number.	 Use counting equipment to show that they can find one more than or one fewer than an amount. Understand that numbers gets bigger as we count on and smaller as we count back.

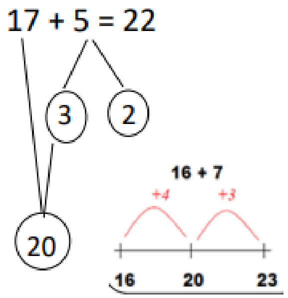
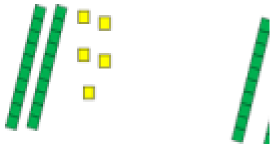
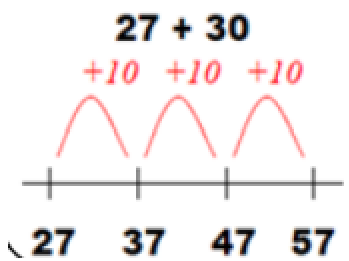
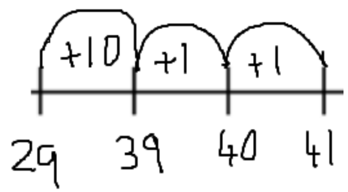
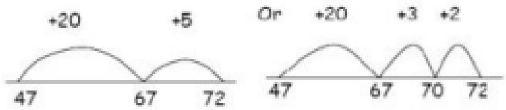
Addition Y1+			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Combining two parts to make a whole Part part whole model	   Use part part whole model. Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar.	Use a part-whole model to represent the numbers.  $\boxed{6} + \boxed{4} = \boxed{10}$ *6 + 4 = 10*
Starting at the bigger number and counting on	Children add one more person or object to a group to find one more	One more than 4 is 5. 	12 + 5 = 17 Place the larger number in your head and count on the smaller number to find your answer.

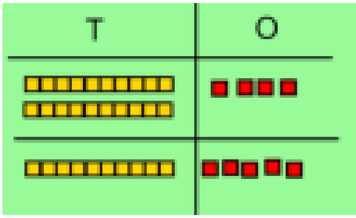
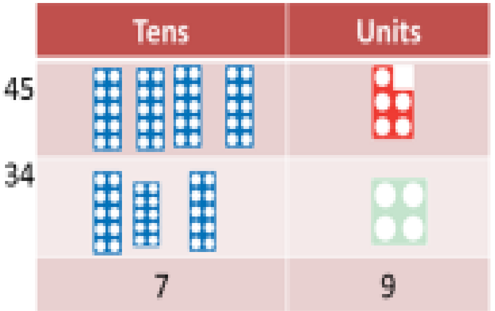
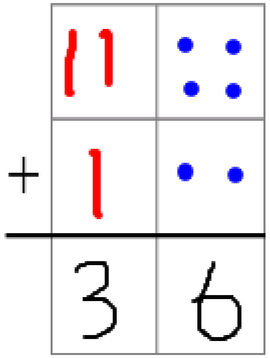
	.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	
Regrouping to make 10	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	Children use counters to complete a ten frame and understand how they can add using knowledge of number bonds to 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now? Use a part-whole model and a number line to support the calculation.  9 + 4 = 13
Represent and use number bonds and related subtraction facts within 20	 2 more than 5.	  	Emphasis should be on the language *'1 more than 5 is equal to 6.'* *'2 more than 5 is 7.'* *'8 is 3 more than 5.'*

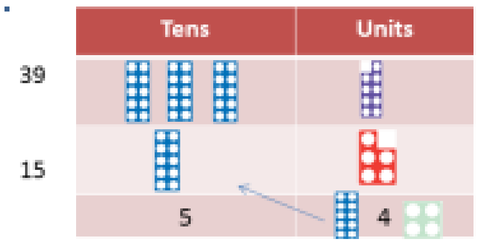
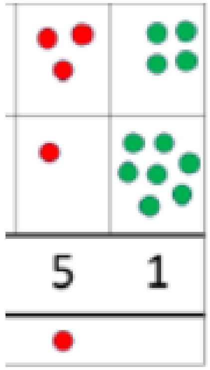
Fact Families	Demonstrate with counters and a part whole model the addition facts for the three numbers. Break apart a group and put back together to find and form number bonds.  	Look at pictorial representations of the parts and the whole. Write the fact family for the whole. 2 + Use five and ten frames to represent key number bonds.  *5 = 4 + 1*  *10 = 7 + 3* 5 = 7, 5 + 2 = 7, 7 = 5 + 2, 7 = 2 +5.  __ + __ = 7 7 = __ + __ __ + __ = 7 7 = __ + __	Children begin to understand that addition is commutative. If I know 2 + 3 = 5 then I know 3 +2 = 5.
Understanding teen numbers as a complete 10 and some more	Complete a group of 10 objects and count more.  *13 is 10 and 3 more.*	Use a ten frame to support understanding of a complete 10 for teen numbers.  *13 is 10 and 3 more.*	*1 ten and 3 ones equal 13.* *10 + 3 = 13*
Addition and subtraction of one-digit and two-digit numbers to 20 including 0.	 Use cubes, counters with part whole model or ten frames to find the whole or split the whole to find the parts.	Use pictures to add two numbers together or to split a whole into two parts. Use bar models to find a missing part or the whole.	Number bonds to 10 should be used to help in addition and subtraction of one and two-digit numbers to 20. If I know 9 + 1 = 10 then I know 19 + 1 = 20. If I know 8 – 4 = 4 then I know 18 – 4 = 14.

Addition Y2+			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Adding multiples of ten	50 = 30 + 20 	 3 tens + 5 tens = ____ tens 30 + 50 = ____	20 + 30 = 50 70 = 50 + 20 40 + □ = 60
Use known number facts	 Children explore ways of making numbers within 20	 □ + □ = 20 20 − □ = □ □ + □ = 20 20 − □ = □	□ + 1 = 16 16 − 1 = □ 1 + □ = 16 16 − □ = 1

Using known facts	 3 + 3 = 6 So I know… 30 + 30 =60 	Children draw their own representations of T and O. 3 + 3 = 6 So I know… 30 + 30 = 60 	3 + 4 = 7 *leads to* 30 + 40 = 70 _____ + 5 = 9 So I know… _____ + 50 = 90
Add three 1 digit numbers	 Combine to make 10 first if possible, or bridge 1o then add third digit	 Regroup and draw representation.  = 15	Combine the two numbers that make/bridge ten then add on the third. 4 + 7 + 6 = $\boxed{10}$ + $\boxed{7}$ 10 = $\boxed{17}$
Add a 2 digit number and ones	 17 + 5 = 22 Use ten frame to make 'magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Count up in ones. 12 + 2 = 14 	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22—17 = 5 22—5 = 17 

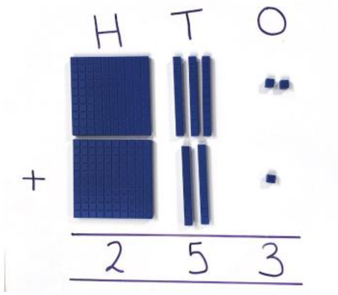
		Use part part whole and number line to model. 	
Add a 2 digit number and tens	 25 + 10 = 35 Explore that the ones digit does not change		27 + 10 = 37 27 + 20 = 47 27 + □ = 57
Add two 2-digit numbers	 Model using dienes , place value counters and numicon	29 + 12 Use number line and bridge ten using part whole if necessary.	Addition by partitioning 25 + 47 20 + 5 40 + 7 20 + 40 = 60 5+ 7 =12 60 + 12 = 72

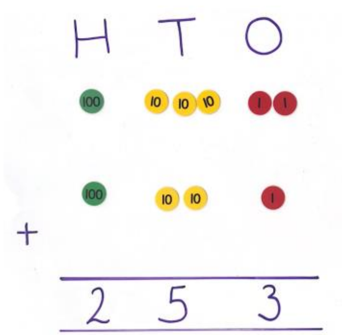
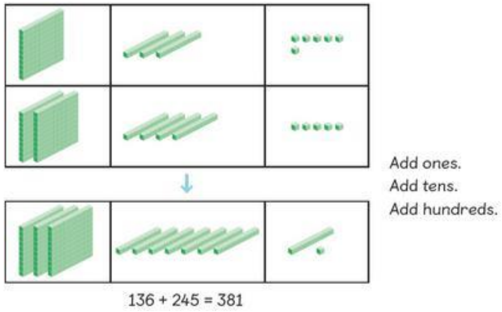
Column method without regrouping	Model using Dienes or numicon. Add together the ones first, then the tens. 24 +15 = 39  30 9 	Children can draw a representation of the grid to further their understanding. 	23 + 13 = ____ 23 + 13 ________

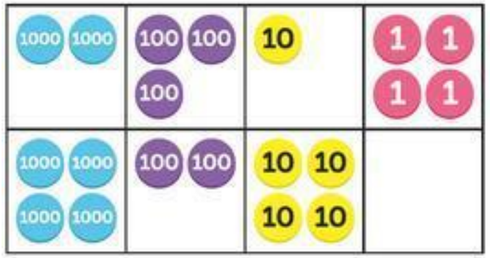
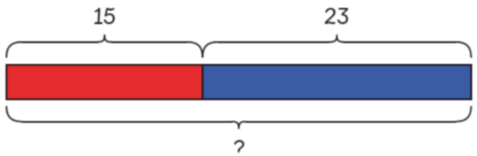
Colum method with regrouping	Exchange ten ones for a ten. Model using numicon and place value counters. 	Children can draw a representation of the grid to further support their understanding, carrying the ten **<u>underneath</u>** the line. 	$\begin{array}{r} 2\ 8 \\ +\ \ \ 7 \\ \hline 3\ 5 \\ \hline 1\ \ \end{array}$

<table>
<tr><th colspan="4">Addition KS2</th></tr>
<tr><th>Objective & Strategy</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Column method without regrouping

Year 3</td>
<td>Using manipulatives children are to line up according to the place value columns and move the manipulatives into place to solve. Children to start with the ones column.

Dienes:


Place value counters:

</td>
<td>The calculations are shown alongside the models (Dienes or place value counters) to show the connection.


Find the sum of 2314 and 4240.

Pictorial bar models are used to represent word problems.

</td>
<td>Children move on to the formal written method in the expanded form.
Add the ones first in preparation for the compact method.

h t o
6 9 2
+ 7 0
2
1 6 0
+ 6 0 0
7 6 2

Children are shown this alongside the compact method before moving to only using the compact method.

h t o
4 3 2
+ 5 2 1
9 5 3</td>
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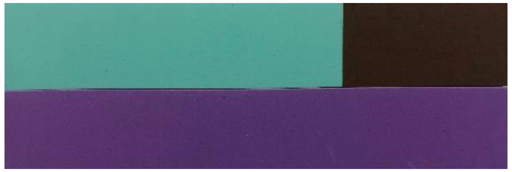
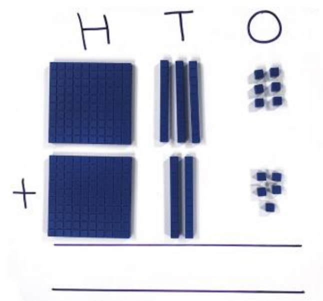
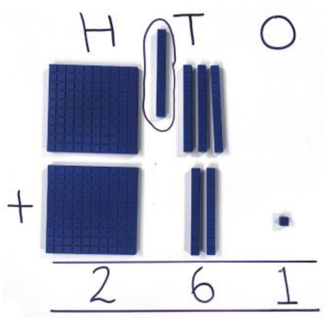
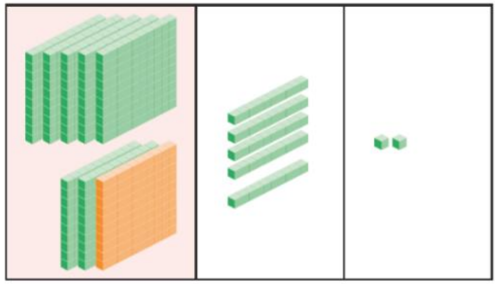
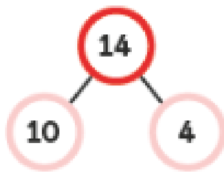
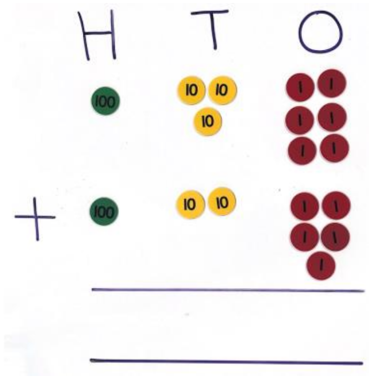
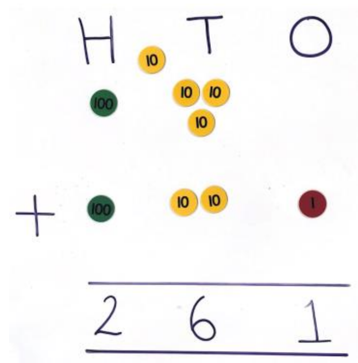
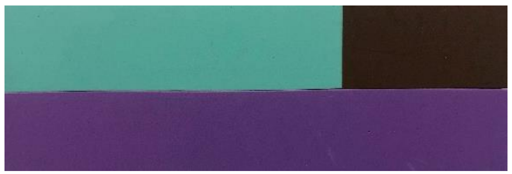
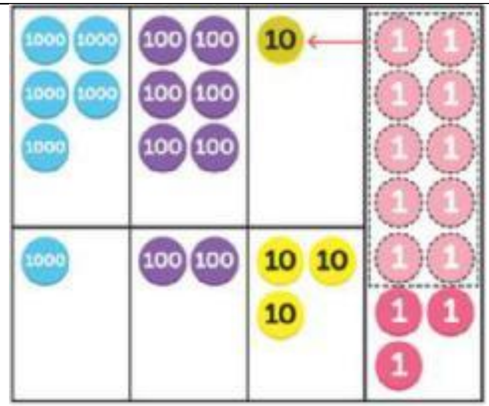
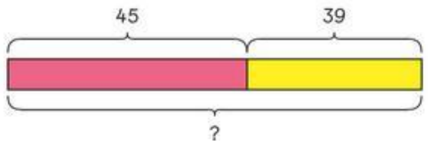
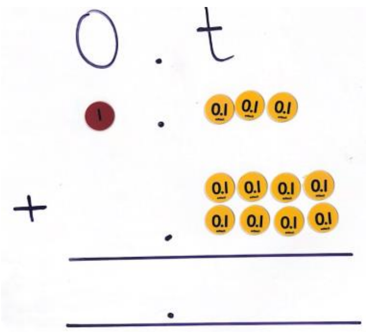
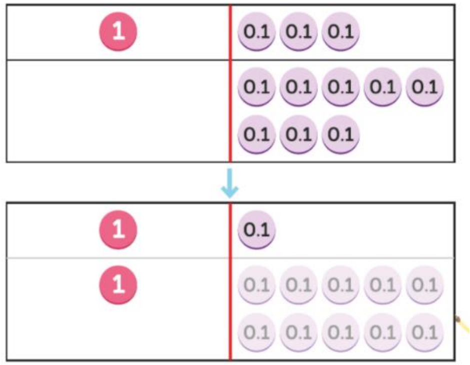
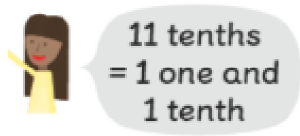
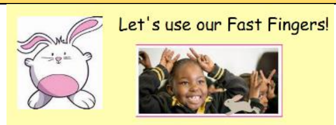
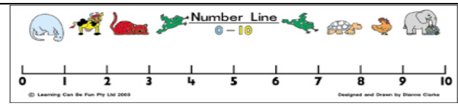
	Addition word problems are modelled with foam bar models showing each part and the whole. 		
Column method with regrouping Year 3 (up to three digits) Year 4 (up to four digits) Year 5 (up to five digits) Year 6 (up to six digits)	Regrouping is demonstrated with Dienes and/or place value counters physically.  Regroup into the next place value column by physically exchanging ten ones for one ten. 	 	The amount that is being regrouped is recorded above the calculation in the appropriate place value column. $\begin{array}{cccc} & h & t & o \\ & \overset{1}{7} & 9 & 2 \\ + & & 6 & 0 \\ \hline & 8 & 5 & 2 \\ \hline \end{array}$ $\begin{array}{ccccc} & \overset{1}{4} & \overset{1}{2} & \overset{1}{5} & 6 \\ + & 1 & 9 & 8 & 7 \\ \hline & 6 & 2 & 4 & 3 \\ \hline \end{array}$

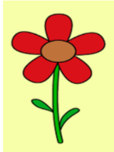
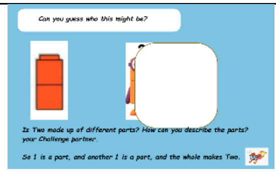
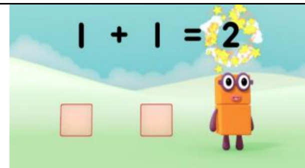
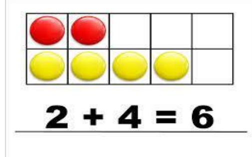
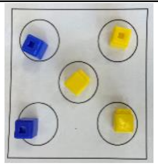
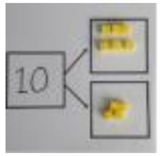
	 Regroup into the next place value column by physically exchanging ten ones for one ten.  Foam bar models are used to represent word problems. 	 Pictorial bar models are used to represent word problems. 	

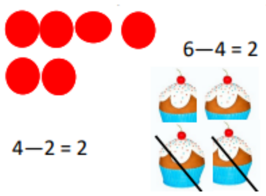
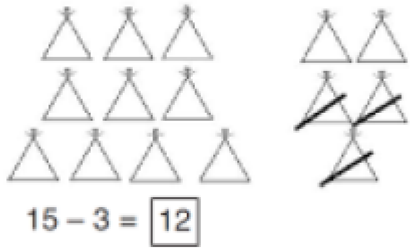
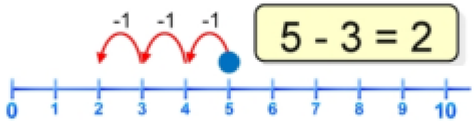
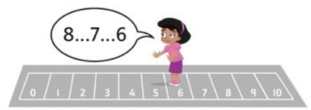
Column method with decimals Year 5 Year 6	Place value counters are used to demonstrate adding decimals. Ensure that the decimal point remains aligned throughout the calculation. Misconception: The decimal point does not have a place value column of its own. 	The calculations are shown alongside the place value counters to show the connection. 	Ensure that children start with the 'lowest place value' (in this case hundredths) and regroup above the calculation in the correct place value column. $\begin{array}{r} \,\text{£}\,\overset{1}{1}\,.\,3\ 0 \\ +\,\text{£}\,0\,.\,8\ 0 \\ \hline \text{£}\,2\,.\,1\ 0 \\ \hline \end{array}$ 

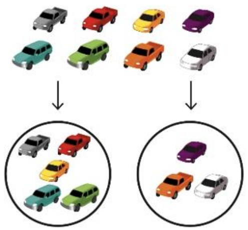
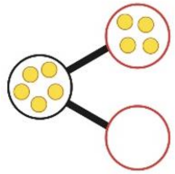
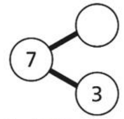
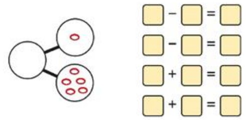
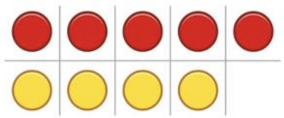
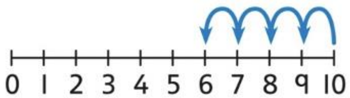
Subtraction Overview						
YR	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Using fingers to show the composition of numbers and use generalisations such as 'First I have 5 then I take away 3, now I have 2 because 5 is made from 2 and 3'.	Taking away ones	Regroup a ten into ten ones	Column method without regrouping (up to three digits)	Column method without regrouping (up to four digits)	Column method without regrouping (more than four digits)	
Use 'staircase model' to understand that numbers get smaller as we take one away.	Counting back	Partitioning to subtract without regrouping	Column method with regrouping (up to three digits)	Column method with regrouping (up to four digits)	Column method with regrouping (more than four digits)	

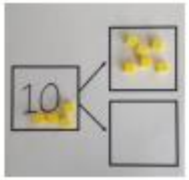
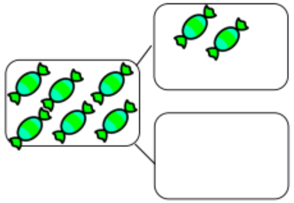
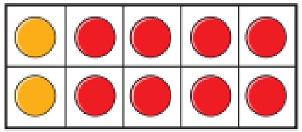
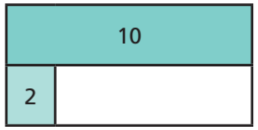
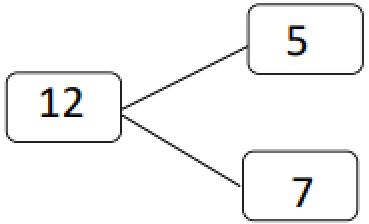
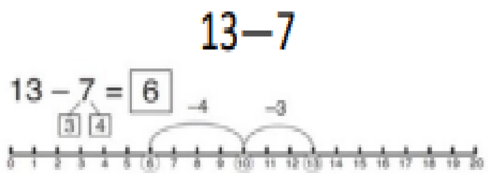
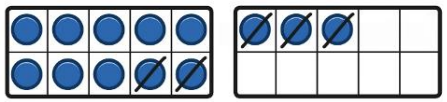
Develop ordinality by understanding the number which will come next or which number came before another when practising stable order counting.	Finding a missing part, given a whole and a part	Column subtraction without regrouping			Column method with decimals	
Understand that a whole is made up of smaller parts.	Find the difference	Column subtraction with regrouping				
Automatically recall number bonds for numbers 0-10.	Represent and use number bonds and related subtraction facts within 20	Subtraction				
Explore the composition of numbers to 10 by investigating part-part-whole relations.	Make 10					
	Subtraction within 20					
	Subtracting 10s and 1s					

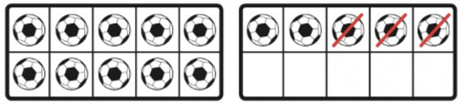
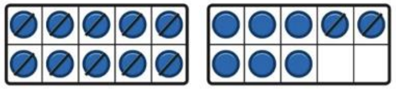
Subtraction YR			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Using fingers to show the composition of numbers and use generalisations such as 'First I have 5 then I take away 3, now I have 2 because 5 is made from 2 and 3'.	 Use their fingers to represent numbers and amounts in games and activities. Developing finger gnosis by showing fingers above head so not counting fingers first.	 Use fingers up and fingers down to represent different parts of the whole, whilst still recognising the whole amount.	  When shown a quantity to 10 can say how many are subsequently hidden from view.
Use 'staircase model' to understand that numbers get smaller as we take one away.	 Use cubes to make staircase patterns of numbers 1-10 recognising each tower of cubes gets bigger when we count on and smaller as we count back.	 Recognise which amounts are 'fewer than' using visual representations. Can spot if staircase pattern is in wrong order or missing a number.	 Use counting equipment to show that they can find one fewer than an amount. Understand that numbers gets smaller as we count back.
Develop ordinality by understanding the number which will come next or which number came before another when practising stable order counting.	 Children have opportunity to make counting collections using a variety of resources.	 Improve accuracy in counting by pointing to each object or using a counting wand, lining up objects and saying how much in the set. Able to identify which set has more and which set has fewer.	 Apply their counting knowledge to numberlines to show an awareness of how numbers are represented with numerals. Able to recognise which number is one less than on a numberline.

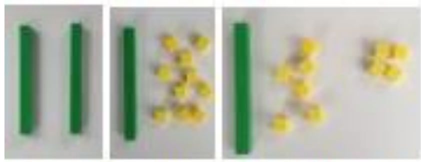
Understand that a whole is made up of smaller parts.	  Children are introduced to language and images of whole and part.	 Able to recognise numbers are can be made of different parts, using cubes and visual representations to explain.	 Use generalisations to explain which parts make whole numbers from 1-10.
Automatically recall number bonds for numbers 0-10.	 Use knowledge of number composition to find different parts of a whole.	 Use fingers to show how numbers can be made of '5 and a bit' and begin recall of number bonds.	 Use ten frame and die frames to represent number bonds as two parts of the whole.
Explore the composition of numbers to 10 by investigating part-part-whole relations.	 Select different resources from environment to make representations of numbers and amounts. Find different ways to represent an amount.	  Show how many more need to be taken away from the whole to make an amount using a rekenrek. Use different coloured counters to show different ways to make 5 on a die frame.	 Introduce children to part part whole model using generalisations such as '5 is made from 2 and 3. 3 and 2 make 5 altogether.' 'Or 6 is a part, 4 is a part 10 is the whole.'

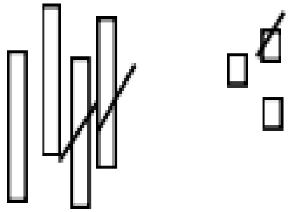
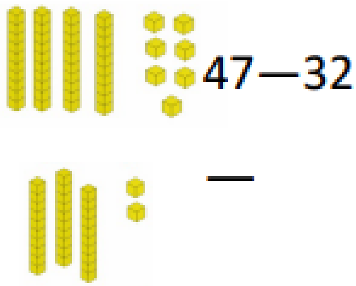
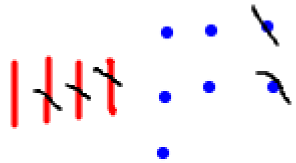
Subtraction Y1+			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Taking away ones	 Use physical objects (counters, cubes etc.) to show how objects can be taken away.	 Cross our drawn objects to show what has been taken away.	7—4 = 3 16—9 = 7
Counting back	 Move objects away from the group, counting backwards.	 Count back in ones using a number line.	Put 13 in your head and count back 4. What number are you at? Children count back to take away and use a number line or number track to support the method.  9 – 3 = 6

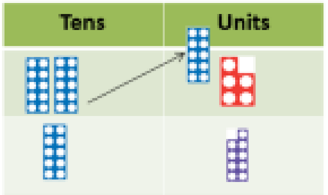
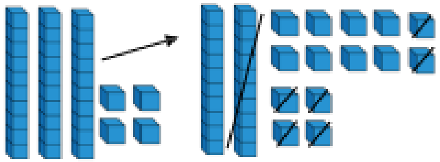
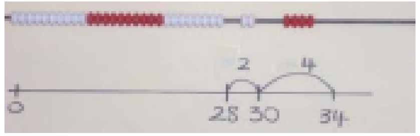
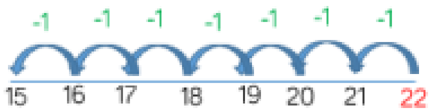
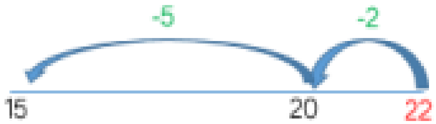
Finding a missing part, given a whole and a part	Children separate a whole into parts and understand how one part can be found by subtraction.  *8 − 5 = ?*	Children represent a whole and a part and understand how to find the missing part by subtraction.  $\boxed{5} - \boxed{4} = \boxed{}$	Children use a part-whole model to support the subtraction to find a missing part.  7 − 3 = ? Children develop an understanding of the relationship between addition and subtraction facts in a part-whole model. 
Find the difference	Ben has 4 cakes. Jo has 8 cakes.  How many fewer cakes does Ben have than Jo? ## Compare objects and amounts Arrange two groups so that the difference between the groups can be worked out.  *8 is 2 more than 6.* *6 is 2 less than 8.* *The difference between 8 and 6 is 2.*	Represent objects using sketches or counters to support finding the difference.  *5 − 4 = 1* *The difference between 5 and 4 is 1.*	Children understand 'find the difference' as subtraction.  *10 − 4 = 6* *The difference between 10 and 6 is 4.*

Represent and use number bonds and related subtraction facts within 20	 If 10 is the whole and 6 in ones of the parts, what is the other part? 10 – 6 = 4	 Use pictorial representations to show the part.   	Move to using numbers within the part whole model.  Sam and Mo have 10 sweets between them. Sam has 4 sweets. How many sweets does Mo have?
Make 10 *Continued in Y2	 14 – 5 = ___ Make 14 on the ten frame. Take 4 away to make ten. Then take one more away so you have taken 5.	 Jump back 3 first to make ten. Use ten as the stopping point. Then jumper back another 4. Represent the use of bonds using ten frames.  *For 13 – 5, I take away 3 to make 10, then take away 2 to make 8.*	16 – 8 How many did we take off first to get to 10? How many left to take off?

Subtraction within 20	Understand when and how to subtract 1s efficiently. Use a bead string to subtract 1s efficiently.  *5 − 3 = 2* *15 − 3 = 12*	Understand when and how to subtract 1s efficiently.  *5 − 3 = 2* *15 − 3 = 12*	Understand how to use knowledge of bonds within 10 to subtract efficiently. *5 − 3 = 2* *15 − 3 = 12*
Subtracting 10s and 1s	Subtract 12 by first subtracting the 10, then the remaining 2.  *First subtract the 10, then take away 2.*	Use ten frames to represent the efficient method of subtracting 12.  *First subtract the 10, then subtract 2.*	Bob has 18 sweets. He eats 12. How many does he have left?

Subtraction Y2+			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Regroup a ten into ten ones	 Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'	 20 − 4 =	20—4 = 16

Partitioning to subtract without regrouping	Use dienes to show how to partition the number when subtracting without regrouping. Step 1  Step 2  Step 3 	Children draw representations of Dienes and cross off.  43—21 = 22	43—21 = 22
Column subtraction without regrouping	 Use base 10 or Numicon to model	Children draw representations to support understanding. 47 - 32 = ___ 	

Column subtraction with regrouping	 Begin with base 10 or Numicon. Move to pv counters, modelling the exchange of a ten into tten ones. Use the phrase 'take and make' for exchange.	Following on from the concrete, children can draw the resources to support understanding. Take 16 away from 34 	$\begin{array}{r} {}^{2}\cancel{3}\,{}^{1}4 \\ -\,1\;\;6 \\ \hline 1\;\;8 \\ \hline \end{array}$
Subtraction	 34—28 Use a bead bar or bead strings to model counting to next ten and the rest.	22 – 7 =   46 – 20 = ______  3 + 3 + 3 = ☐	22 – 7 = ____ ____ = 22 - 7

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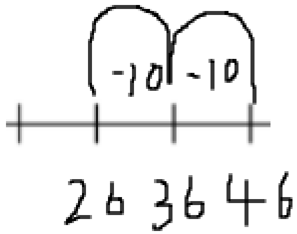
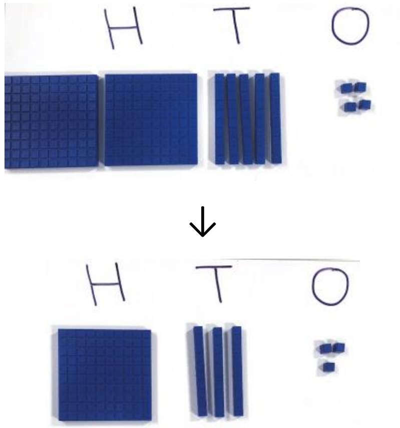
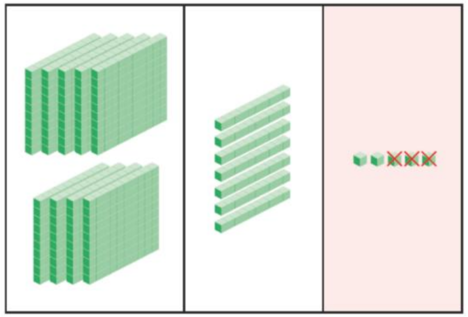


31 – 12 = ______

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

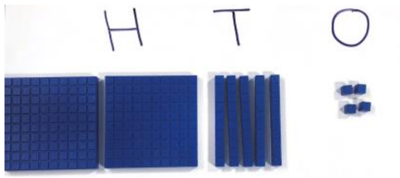
<table>
<tr><th colspan="4">Subtraction KS2</th></tr>
<tr><th>Objective & Strategy</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Column method without regrouping

Year 3 (up to three digits)</td>
<td>Children place Dienes/place value counters in to place value columns. Manipulatives are removed physically to demonstrate the subtraction.

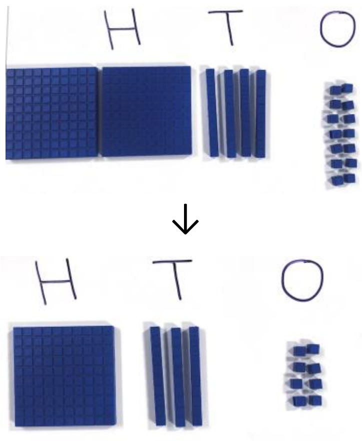
E.g. 254 – 121 = 133
</td>
<td>The calculations are shown alongside the models (Dienes or place value counters) to show the connection.
</td>
<td>h t o
9 7 5
− 7 2 3
2 5 2

Children use the formal written method, calculating the ones first.</td>
</tr>
<tr>
<td>Column method with regrouping

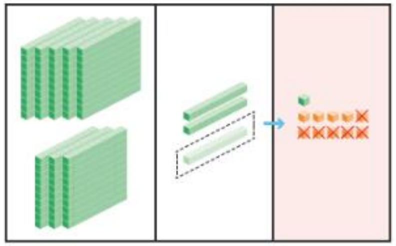
Year 3 (up to three digits)
Year 4 (up to four digits)
Year 5 (more than four digits)
Year 6 (more than four digits)</td>
<td>Children place Dienes/place value counters in correct columns. Manipulatives are removed physically to demonstrate the subtraction.

E.g. 254 – 116 = 138

Regroup into the next place value column by physically exchanging ten ones for one ten.</td>
<td>The calculation are shown alongside the models (Dienes or place value counters) to show the connection.</td>
<td>Children work in stages starting with the ones. They cross out the number which needs renaming and write the new number directly on top.

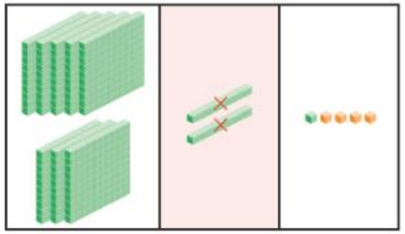
h t o
8 $^{2}\cancel{3}$ $^{11}\cancel{1}$
− 2 6
5</td>
</tr>
</table>



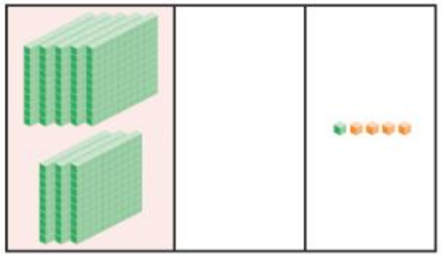
Step 1 Regroup 1 ten into 10 ones.
Subtract the ones.
11 ones − 6 ones = 5 ones



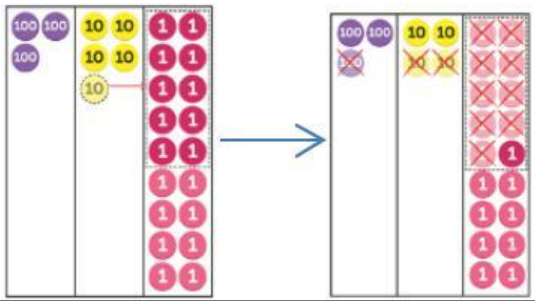
Step 2 Subtract the tens.
2 tens − 2 tens = 0 tens



Step 3 Subtract the hundreds.

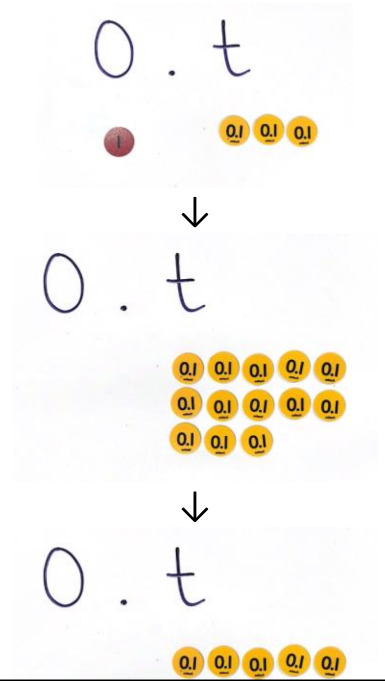


831 − 26 = 805

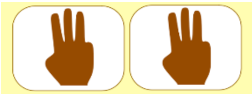
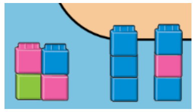
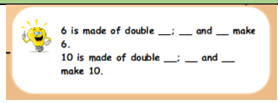
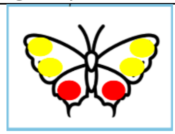
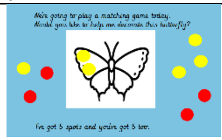


	h	t	o
	8	$^{2}\cancel{3}$	$^{11}\cancel{1}$
−		2	6
		0	5

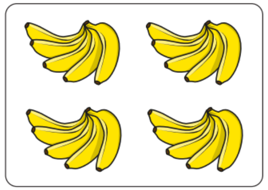
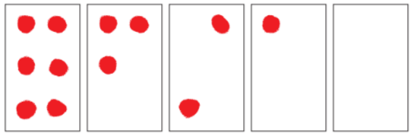
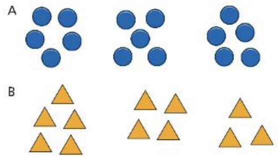
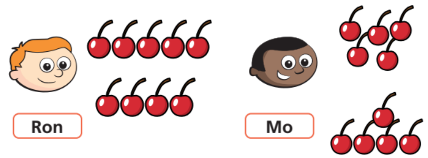
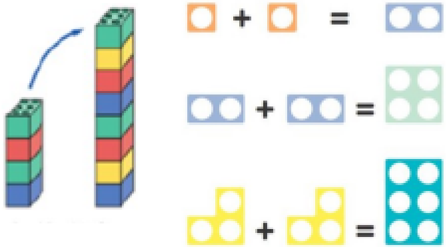
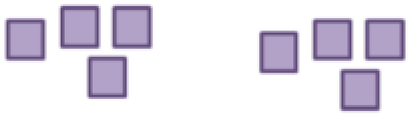
	h	t	o
	8	$^{2}\cancel{3}$	$^{11}\cancel{1}$
−		2	6
	8	0	5

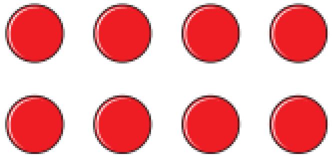
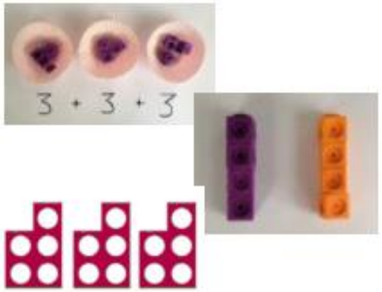
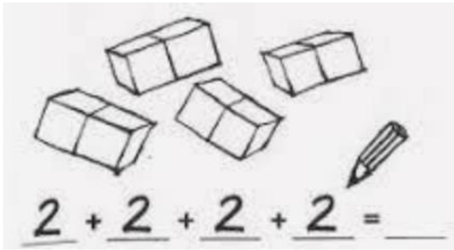
Column method with decimals Year 5 Year 6	Place value counters are used to demonstrate subtracting decimals. Ensure that the decimal point remains aligned throughout the calculation. 	The calculations are shown alongside the place value counters to show the connection.  $\begin{array}{r} £\,1\,.\,3\,0 \\ -\,£\,0\,.\,8\,0 \\ \hline \\ \hline \end{array}$	Children work in stages starting with the lowest place value. They cross out the number which needs renaming and write the new number directly on top. $\begin{array}{r} £\,\overset{0}{\cancel{1}}\,.\,\overset{13}{\cancel{3}}\,0 \\ -\,£\,0\,.\,8\,0 \\ \hline £\,0\,.\,5\,0 \\ \hline \end{array}$

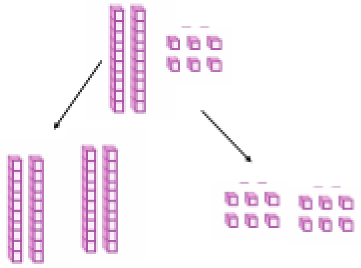
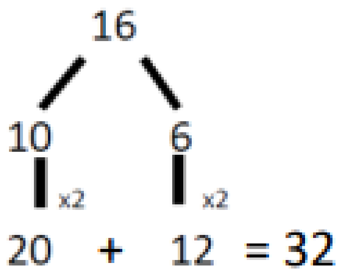
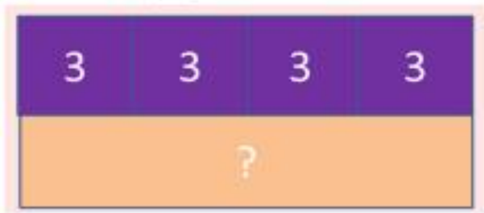
Multiplication Overview						
YR	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Understand that double is the same amount again.	Recognising and making equal groups	Doubling	Expanded method multiplying a two-digit number by one digit.		Compact method multiplying a two-digit number by two digit.	Multiplying decimals
Investigate sets of objects to make double of that amount.	Doubling	Counting in multiples of 2, 3, 5 and 10 from 0 (repeated addition	Compact method multiplying a two-digit number by one digit.			
	Finding the total of equal groups by counting in 2s, 5s and 10s	Multiplication is commutative				
	Repeated addition	Using the inverse				

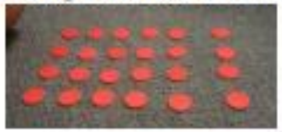
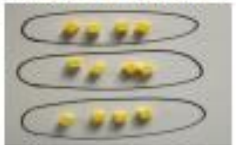
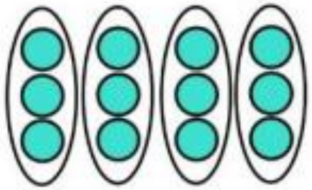
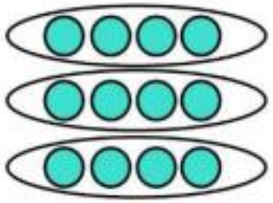
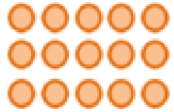
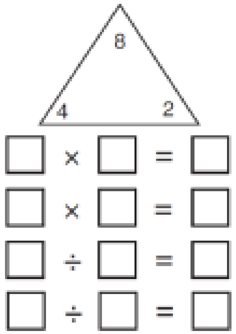
Multiplication YR			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Understand that double is the same amount again.	 Use fingers to show same amount on both hands.	 Use cubes or counters to show doubles as two equal groups.	 Use generalisations to explain that doubles are parts of a whole.
Investigate sets of objects to make double of that amount.	   Share objects from environment into two equal groups to see if a double.	Look at  different visual representations of doubles to explain if 'double or not.'	

			Investigate amounts to see what number can be doubled to make the whole.

Multiplication Y1			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Recognising and making equal groups	Equal and Unequal Are these equal or unequal?  Making equal groups Use objects in your classroom to make these groups. • 5 equal groups of 3 • 3 equal groups of 5	 Kim is drawing 5 equal groups of 6. Can you finish Kim's drawing? Children draw and represent equal and unequal groups.  	Ron and Mo have some cherries.  Who has made equal groups? ___________ Describe equal groups using words. *Two equal groups of five.* *Five equal groups of two.*
Doubling	 Use practical activities using resources to demonstrate doubling.	Double 4 is 8  Draw pictures to show how to double numbers.	Double 3 6 + 6 Double 6 7 + 7 Double 10 3 + 3 Double 7 10 + 10 Match the doubles to the additions.

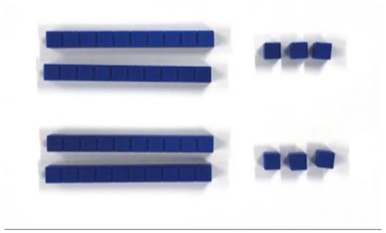
Finding the total of equal groups by counting in 2s, 5s and 10s	 Count the groups as children are skip counting. Children may use their fingers as they are skip counting.	 Circle groups of 2. Children to make representations to show counting in multiples.	Count in multiples of a number loud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30
Repeated addition	 Use different objects to add equal groups.		 Write addition sentences to describe objects and pictures.

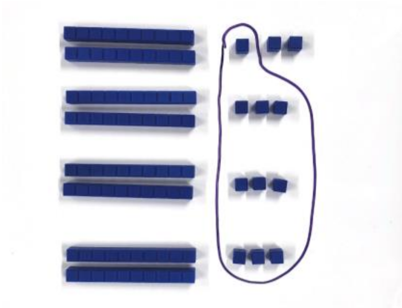
Multiplication Y2			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
*See all Y1 objectives and strategies. Covered in Y2.			
Doubling	Double 26. Model doubling using dienes and PV counters.  40 + 12 = 52	Draw pictures and representations to show how to double numbers.	Partition a number and then double each part before recombining it back together. Double 16. 
Counting in multiples of 2, 3, 5 and 10 from 0 (repeated addition)	Count the groups as children are skip counting. 5 + 5 + 5 	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 $4 \times 3 = \square$

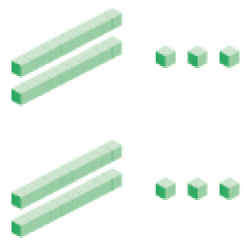
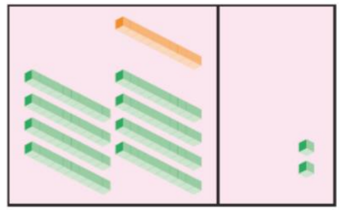
Multiplication is commutative	Create arrays using counters and cu-bes and Numicon.    Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.  	Use representations of arrays to show different calculations and explore commutativity.  	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$
Using the inverse	 Finding groups.		$2 \times 4 = 8$ $4 \times 2 = 8$ $8 \div 2 = 4$ $8 \div 4 = 2$ $8 = 2 \times 4$ $8 = 4 \times 2$ $2 = 8 \div 4$ $4 = 8 \div 2$ Show all 8 related fact family sentences.

<table>
<tr><th colspan="4">Multiplication KS2</th></tr>
<tr><th>Objective & Strategy</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Expanded method multiplying a two-digit number by one digit.

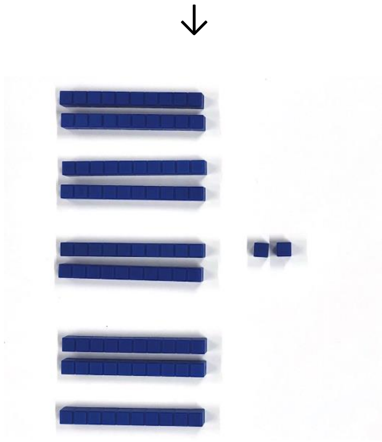
Year 3</td>
<td>Dienes and place value counters are used to model finding ‘lots of’ a number.

E.g. 2 x 23 =
“2 lots of 23”

E.g. 4 x 23 =
“4 lots of 23”

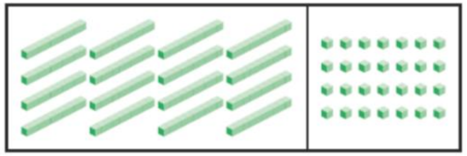
Show the renaming as grouping ten ones and replacing them with one ten.
</td>
<td>The calculations are shown alongside Dienes and place value counters to show the connection.

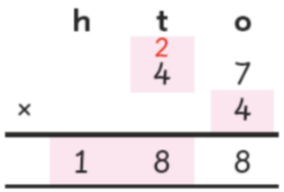
First without renaming.
2 x 23 =

Then, with renaming.
4 x 23 =
</td>
<td>Children multiply in stages starting with the ones.

First without renaming.
2 x 23 =
$$\begin{array}{ccc} & t & o \\ & 2 & 3 \\ \times & & 2 \\ \hline & & 6 \\ + & 4 & 0 \\ \hline & 4 & 6 \\ \hline \end{array}$$
Then, with renaming.
4 x 23 =
$$\begin{array}{ccc} & t & o \\ & 2 & 3 \\ \times & & 4 \\ \hline & 1 & 2 \\ + & 8 & 0 \\ \hline & 9 & 2 \\ \hline \end{array}$$</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Compact method multiplying a two-digit number by one digit.

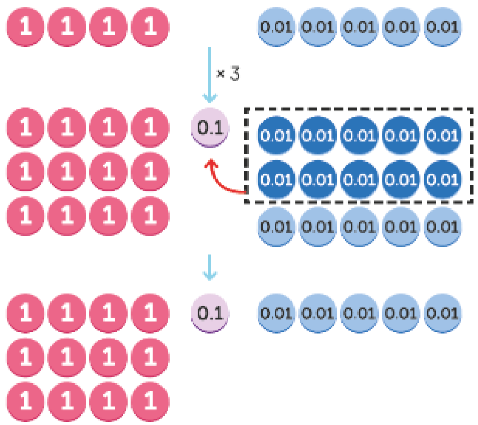
Year 3
Year 4</td><td>As above, manipulatives may still be used with the corresponding long multiplication modelled alongside.</td><td>The calculations are shown alongside the Dienes and place value counters to show the connection.

</td><td>Children to move to the compact method, showing the renamed digit above the correct place value column.

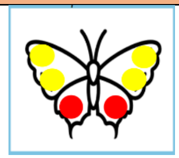
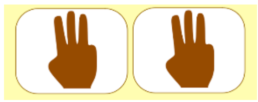
</td></tr>
<tr><td>Compact method multiplying a two-digit number by two digit.

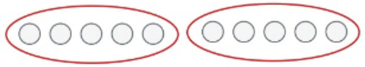
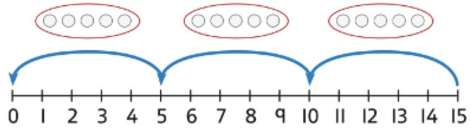
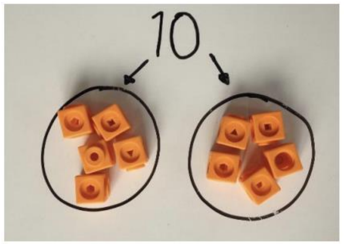
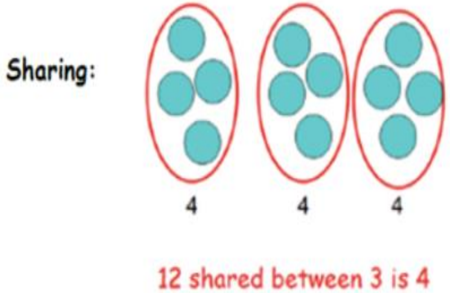
Year 5
Year 6</td><td>As above, manipulatives may still be used with the corresponding long multiplication modelled alongside.</td><td>A grid may be shown to break the calculation into its place value parts.

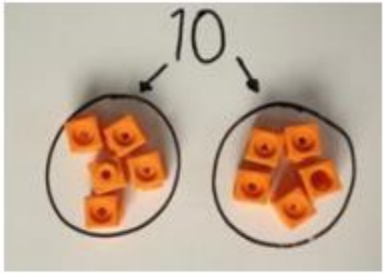
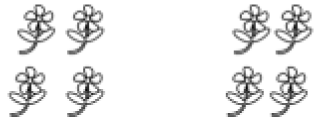
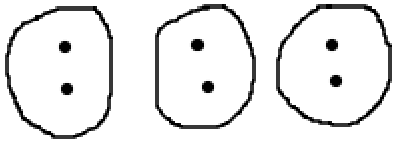
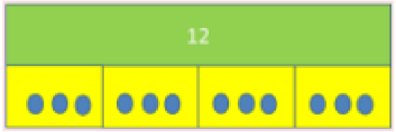
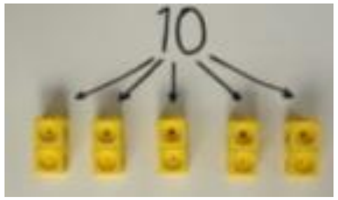
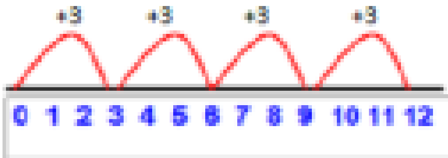
<table><tr><td>x</td><td>100</td><td>10</td><td>3</td></tr><tr><td>20</td><td>2000</td><td>200</td><td>60</td></tr><tr><td>3</td><td>300</td><td>30</td><td>9</td></tr></table></td><td>Children multiply in stages starting with the ones.</td></tr>
</table>

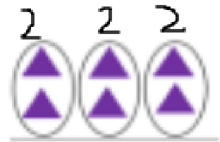
			$\begin{array}{r} 1\ 1\ 3 \\ \times \quad 2\ 3 \\ \hline 3\ 3\ 9 \\ +\ 2\ 2\ 6\ 0 \\ \hline 2\ 5\ 9\ 9 \\ \hline \end{array}$
Multiplying decimals Year 6	Place value counters are used to model. Ensure that the decimal point is shown in the correct places in both the factors and the product.	The calculations are shown alongside visual representation of place value counters to show the connection. 	Children multiply in stages starting with the lowest place value column (in this case hundredths). $\begin{array}{r} 4.0\ 5 \\ \times \quad 3 \\ \hline \end{array}$ $\begin{array}{r} 4.\overset{1}{0}\ 5 \\ \times \quad 3 \\ \hline 5 \end{array}$ $\begin{array}{r} 4.\overset{1}{0}\ 5 \\ \times \quad 3 \\ \hline 1\ 2.1\ 5 \\ \hline \end{array}$

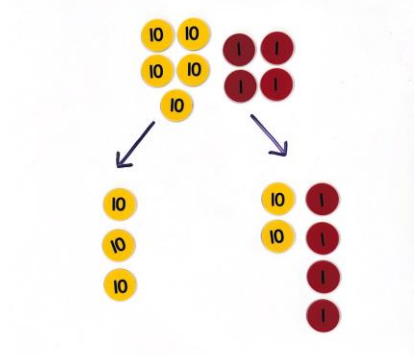
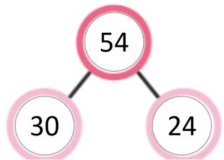
Division Overview						
YR	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Understand that half is sharing equally in two parts.	Grouping	Division as sharing	Partitioning to divide	Short division with remainders		Dividing decimals
Sharing an amount equally between groups.	Division as sharing (sharing objects into groups)	Division as grouping	Short division without renaming			
			Short division with renaming			

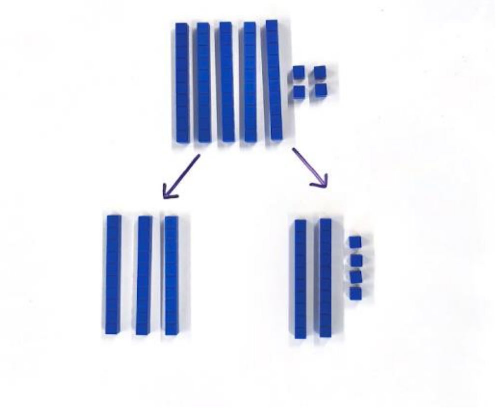
Division YR			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Understand that half is sharing equally in two parts.	 Select resources from classroom to make 2 equal collections.	 Can use pictures or shapes to share into two equal parts.	 Can identify amounts that can be halved from different representations.
Sharing an amount equally between groups.	 Select resources from classroom to make equal collections.	 Use fingers to show equal groups on each hand.	 Can use pictures or shapes to share into groups of equal parts.

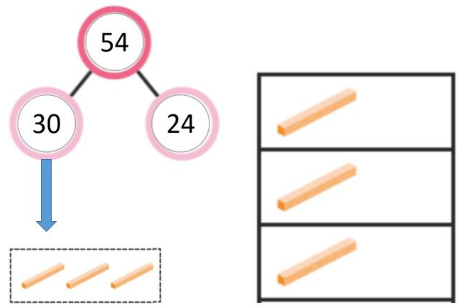
Division Y1			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Grouping	Learn to make equal groups from a whole and find how many equal groups of a certain size can be made. Sort a whole set people and objects into equal groups.  *There are 10 children altogether.* *There are 2 in each group.* *There are 5 groups.*	Represent a whole and work out how many equal groups.  *There are 10 in total.* *There are 5 in each group.* *There are 2 groups.*	Children may relate this to counting back in steps of 2, 5 or 10. 
Division as sharing (sharing into groups)	   I have 10 cubes. Can you share them equally in 2 groups?	 Use pictures of shapes to share quantities.	12 shared between 3 is 4.

Division 2+			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Division as sharing (sharing into groups)	I have 10 cubes, can you share them equally in 2 groups?  	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$ $6 \div 3 = 2$  Children use bar modelling to show and support understanding. $12 \div 4 = 3$  	$12 \div 3 = 4$
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use number lines for grouping.  	$20 \div 5 = 4$ Divide 20 into groups of 5. How many groups are there altogether?

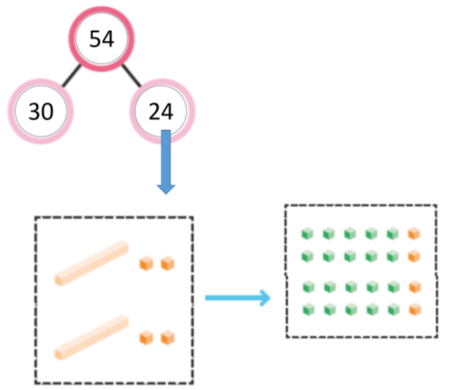
		Children use pictures or shapes to group quantities. $6 \div 2 = 3$  $6 \div 2 = 3$  	

Division KS2			
Objective & Strategy	**Concrete**	**Pictorial**	**Abstract**
Partitioning to divide Year 3	Dienes and place value counters are used to model partitioning and grouping.  	54 ÷ 3 = Step 1: Partition the dividend (54).  Step 2: Divide the ten lots of your divisor by the divisor (30 ÷ 3).	Show division by partitioning, writing each step of the calculation down. E.g. 54 ÷ 3 = Partition 54 into 30 + 24 30 ÷ 3 = 10 24 ÷ 3 = 18 10 + 18 = 28

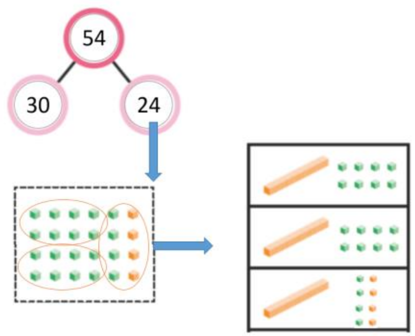




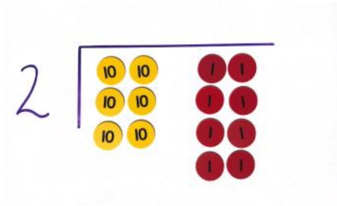
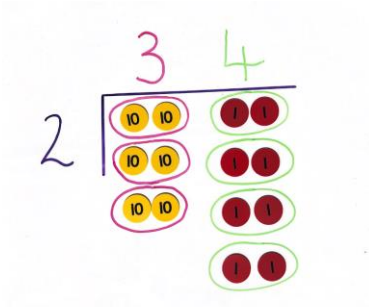
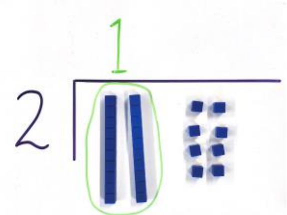
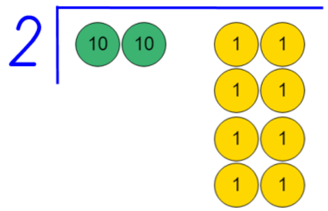
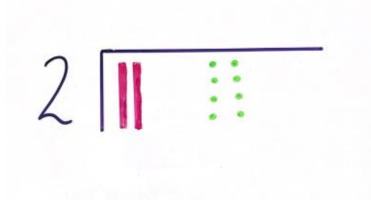
Step 3: Rename the 'leftovers'.

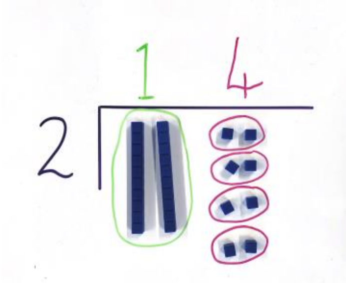


Step 4: Divide the 'leftovers' by the divisor (24 ÷ 3).



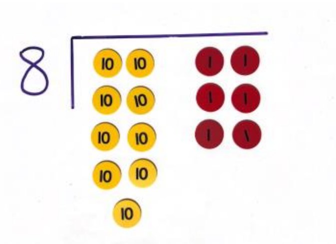
Step 5: Add the results.

Short division without renaming Year 3 Year 4	Dienes and place value counters are used to model the division. Place value counters:  ↓  Dienes:  ↓	Place value counters are shown on the interactive whiteboard or Dienes are drawn, modelling grouping.  	Children to divide in stages, starting with calculations that require no renaming. $\begin{array}{r}3\ 4\\ 2\overline{)6\ 8}\end{array}$

<table>
<tr>
<td></td>
<td>
</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short division with renaming

Year 3
Year 4</td>
<td>Place value counters and Dienes are used to model renaming.

Place value counters:



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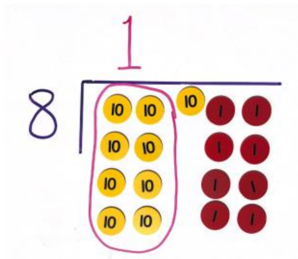

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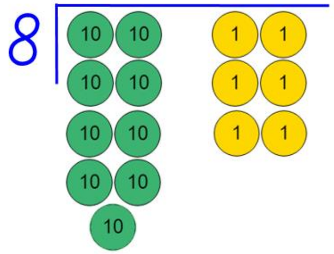
Exchange the ten counter for ten ones counters in order to divide the ones.</td>
<td>Place value counters are shown on the interactive whiteboard or Dienes are drawn, modelling grouping.



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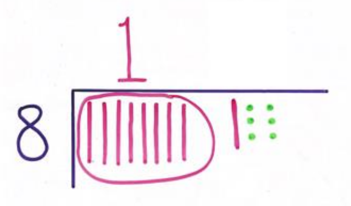
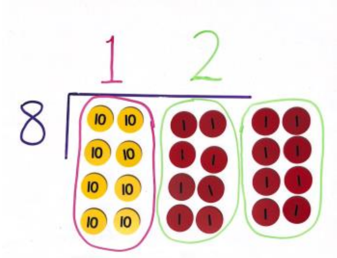
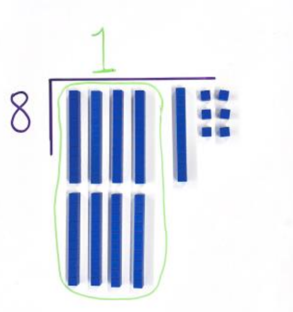
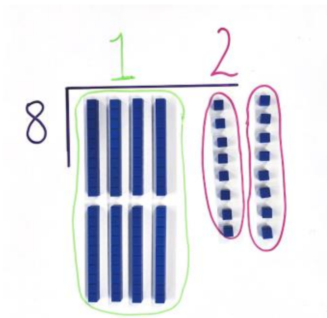
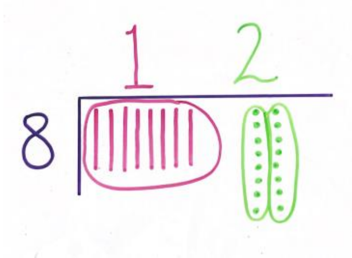
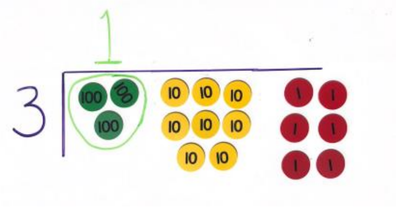


↓
Exchange the ten counter for ten ones counters in order to divide the ones.</td>
<td>Children divide in stages starting with the highest place value. Rename in the correct place value column.

$$\begin{array}{r} 1\ \ 2 \\ 8\overline{)9\,^{1}6} \end{array}$$</td>
</tr>
</table>

	 Dienes:  ↓ 		
Short division with remainders Year 4 Year 5	Place value counters and Dienes are used to model. Place value counters:	Place value counters are shown on the interactive whiteboard or Dienes are drawn, modelling grouping.	Children divide in stages starting with the highest place value column. $$\begin{array}{r l} & \,1\;\;2\;\;8 \quad \text{remainder } 2 \\ 3 & \big)\,3\;\;8\;\;{}^{2}6 \end{array}$$



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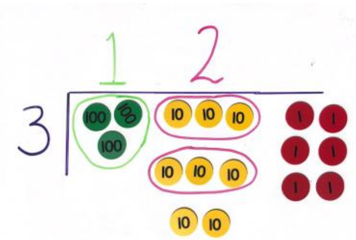
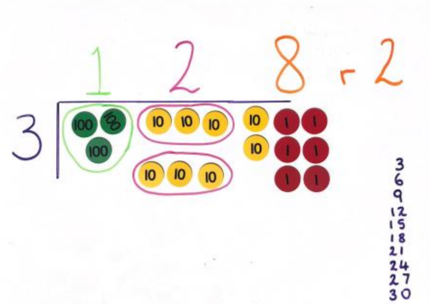
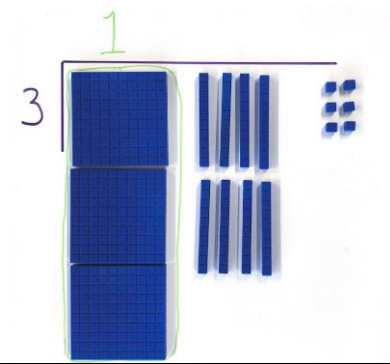
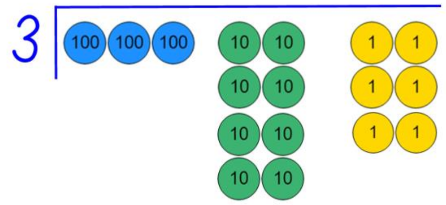


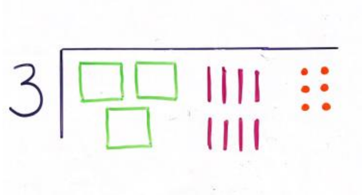
When there are remainders to the ones group, they are shown with an r after the calculation.



Dienes:







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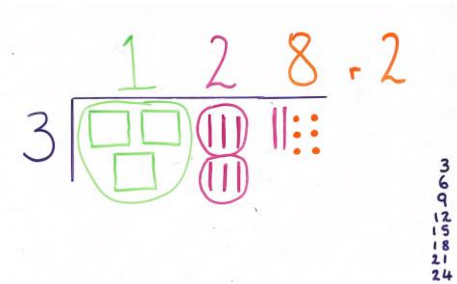
When there are remainders to the ones group, they are shown with an r after the calculation.



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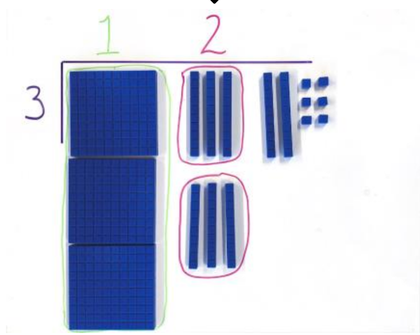

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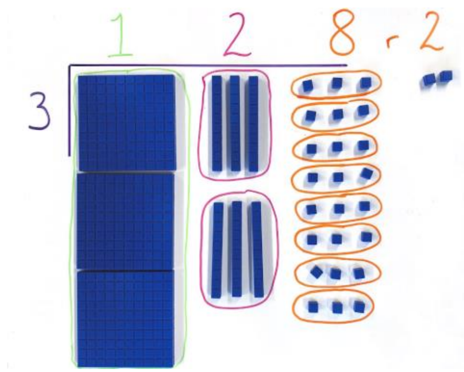
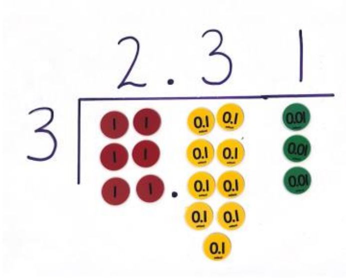
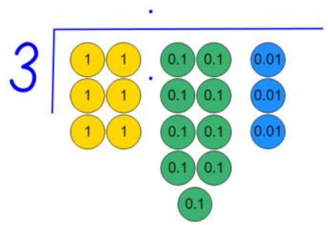
When there are remainders to the ones group, they are shown with an ‘r’ after the calculation.



Dividing decimals Year 6	Place value counters are used to model. Ensure that the decimal point is shown in the correct places in both the dividend and the quotient. 	Place value counters are shown on the interactive whiteboard, modelling grouping. 	Children divide in stages starting with the highest place value. $\begin{array}{r} 2.31 \\ 3\overline{)6.93} \end{array}$