Sussex Road Primary School

Calculation Policy 2024-25

How to use the policy

This mathematics policy is based around the White Rose teaching scheme and a guide for all staff at Sussex Road Primary School. It has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added.

This document sets out the progression of mathematical skills for children to progress through. Even though there are suggested year groups throughout each stage, this document should be used flexibly to support the teaching and learning of mathematics. It is expected that teachers will use their professional judgement as to when consolidation of existing skills is required or if to move onto the next concept. However, the focus must always remain on breadth and depth rather than accelerating through concepts. Children should not be extended with new learning before they are ready, they should deepen their conceptual understanding by tackling challenging and varied problems. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

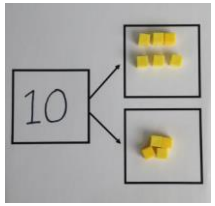
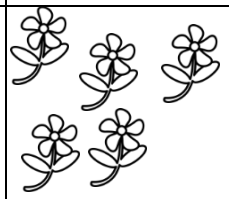
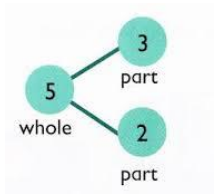
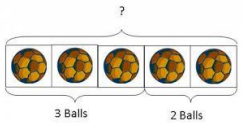
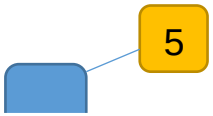
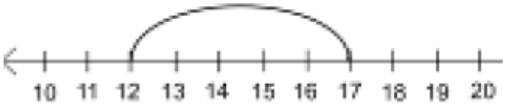
Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.

Pictorial representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem.

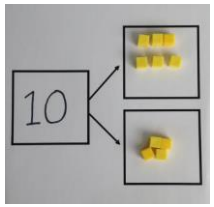
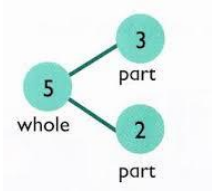
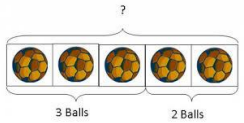
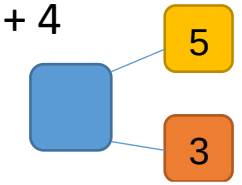
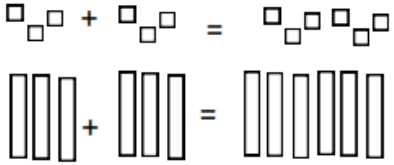
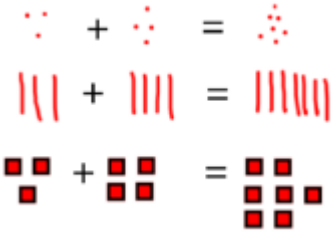
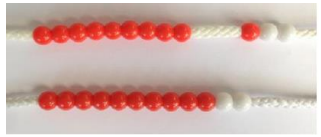
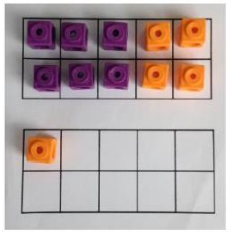
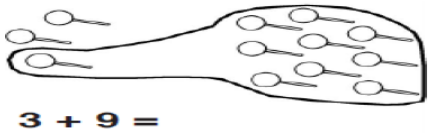
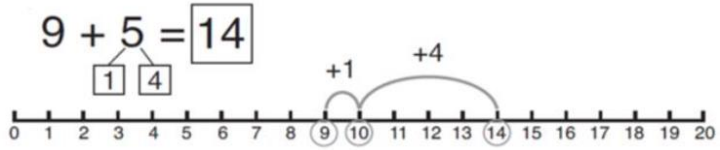
Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example 12 x 2 = 24.

It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

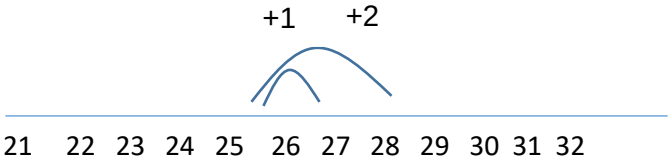
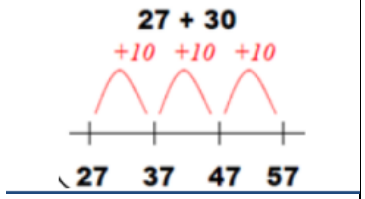
Year 1 - Addition

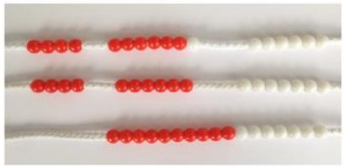
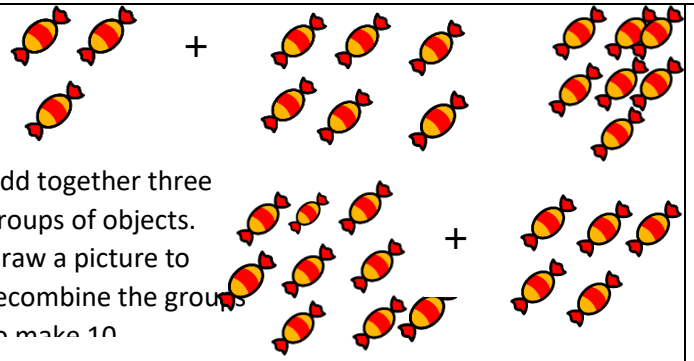
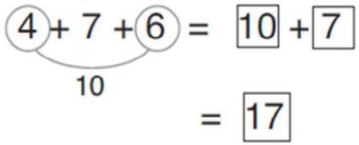
Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part- whole model	  Use part whole model. Use cubes to add two numbers together as a group or in a bar.  EYFS will use this method	   Use pictures to add two numbers together as a group or in a bar.  EYFS will use this method	4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	  Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer. Other resources can be used before bead strings such as numicon.	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.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

Year 2 - Addition

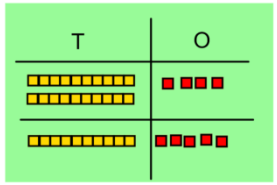
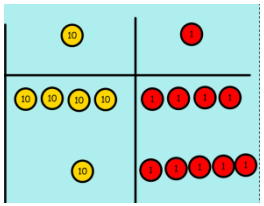
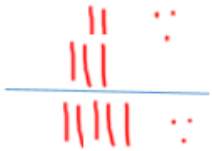
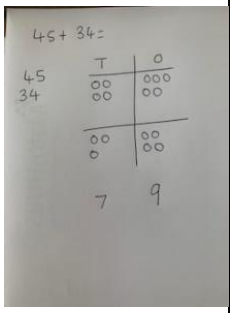
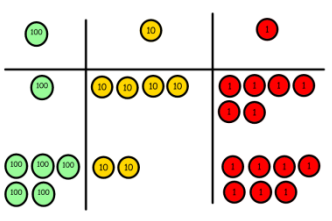
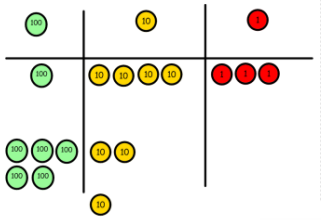
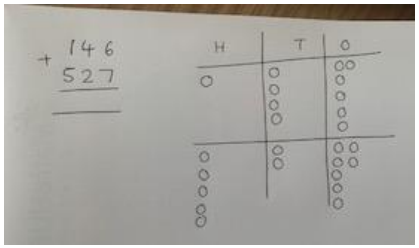
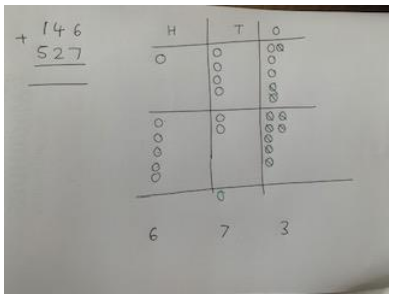
Objective and Strategies	Concrete	Pictorial	Abstract
Part- whole model	  Use part whole model. Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar. 	4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Using known facts		 Children draw represenations to represent , H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Regrouping to make 10. This is an essential skill for column addition later on.	  6 + 5 = 11 Start with the bigger number and use the smaller number to make 10. Use ten frames.	Use pictures or a number line. Regroup or partition the smaller number to make 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?

Year 2 - Addition

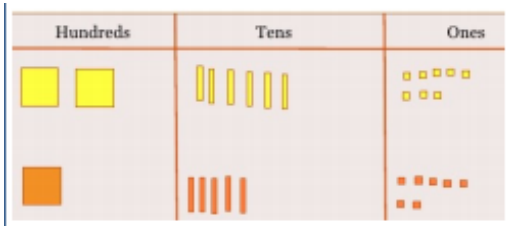
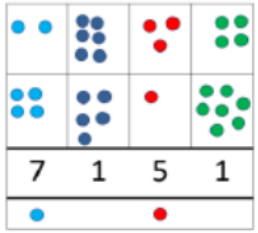
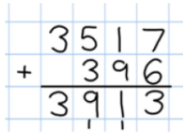
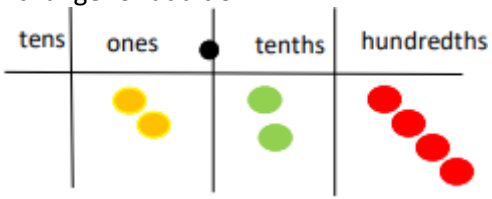
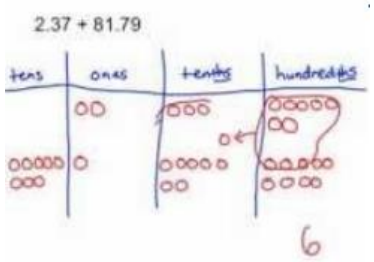
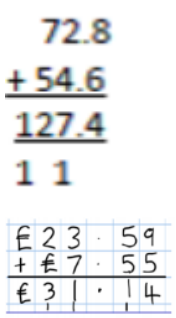
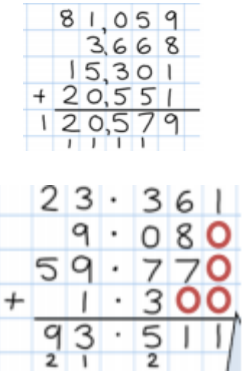
Adding 1 more	 25 + 1 = 26 25 + 2 = 27 Explore that the ones digit and sometimes the tens digit changes.	25 + 1 = 25 + 2=  Children use number lines	25 + 1 = 26 25 + 2 = 27
Adding 10 more	 25 + 10 = 35 Explore that the ones digit does not change		25 + 10 = 35 25 + 20 = 45

Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10	 Combine the two numbers that make 10 and then add on the remainder.

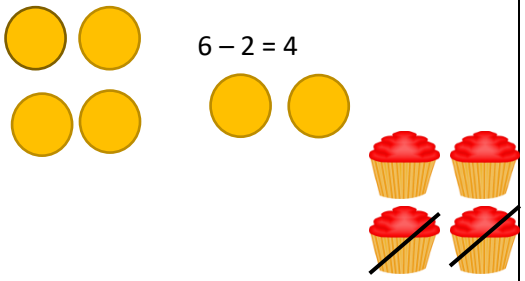
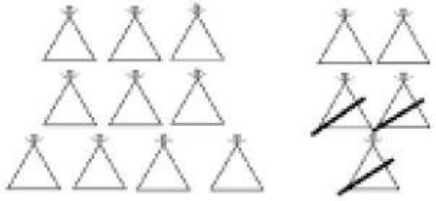
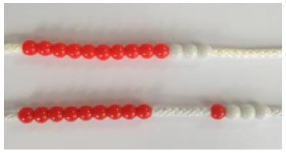
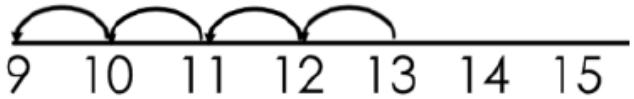
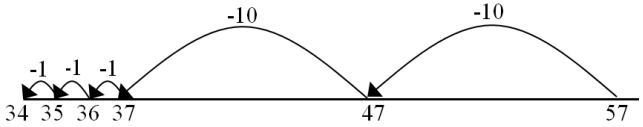
Year 3 - Addition

Objective and Strategies	Concrete	Pictorial	Abstract
Column method- no regrouping	24 + 15= 24 +15 Add together the ones first then add the tens. Use the dienes blocks first before moving onto place value counters. Use place value grids to support  	Drawing notations to support.  	Calculations 21 + 42 = 21 + 42
Column method- regrouping	Make both numbers on a place value grid.  146 + 527 Add up the ones and exchange 10 ones for one 10. Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.  146 + 527 This can also be done with dienes to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. 146 + 527 673 1	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.  	Start by partitioning the numbers before moving on to clearly show the exchange below the addition. 20 + 5 40 + 8 60 + 13 = 73 536 + 85 621 1 1

Year 4-6 - Addition

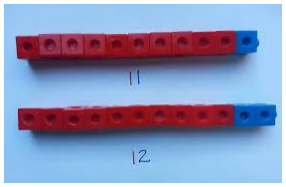
Objective and Strategies	Concrete	Pictorial	Abstract
Column method Year 4 – add numbers with more than 4 digits	Children continue to use dienes or place value counters to add involving exchanging and non- exchanging. Exchanging up to ten hundreds for a thousand. 	Children can draw representations using a place value grid. 	Continuing on from Year 3 to carry hundreds as well as tens. This can also be related to money and measures. 
Column method Year 5 – add numbers with more than 4 digits Add decimals with 2 decimal places, including money.	See Year 4 method Introduce decimal place value counters and model exchange for addition. 	See Year 4 method 	
Column method Year 6 - Add several numbers of increasing complexity Including adding money, measure and decimals with different numbers of decimal points	See Year 4 method	See Year 4 method	 Insert zeros for place vale holders.

Year 1 - Subtraction

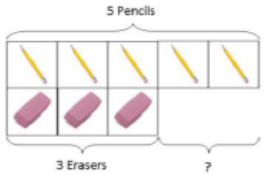
Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc. to show how objects can be taken away.  6 – 2 = 4 EYFS will use this method	Cross out drawn objects to show what has been taken away.  15 – 3 = 12 EYFS will use this method	18 -3= 15 8 – 2 = 6
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.  13 – 4 Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number track  Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can progress all the way to counting back using two 2 digit numbers.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

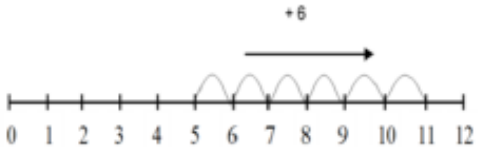
Year 1 - Subtraction

<table>
<tr>
<td>Find the difference</td>
<td>Compare amounts and objects to find the difference.

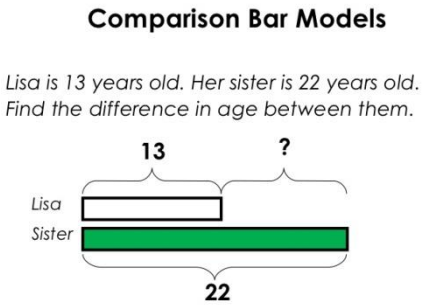
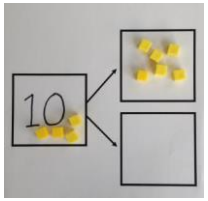
Use cubes to build towers or make bars to find the difference

Use basic bar models with items to find the difference</td>
<td> 

Count on to find the difference.

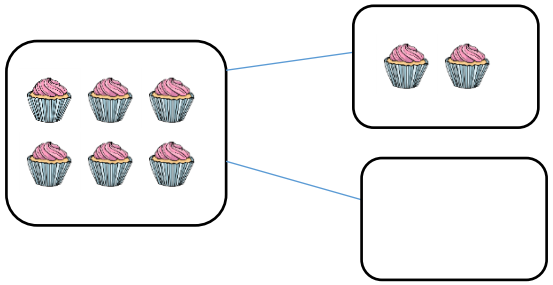
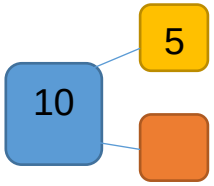
Draw bars to find
The difference between 2 numbers.

 
</td>
<td>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the numbers of sandwiches.</td>
</tr>
<tr>
<td>Part Part Whole Model
(using known facts)</td>
<td> 

Link to addition- use the part whole model to help explain the inverse between addition and subtraction.

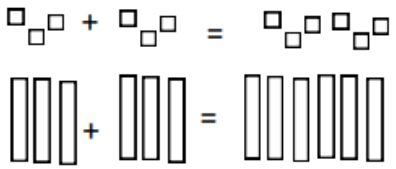
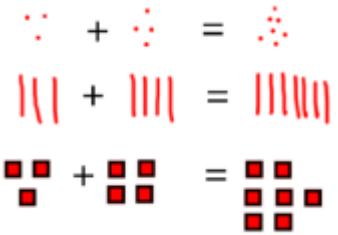
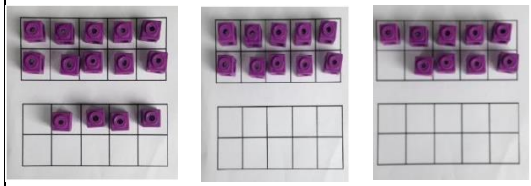
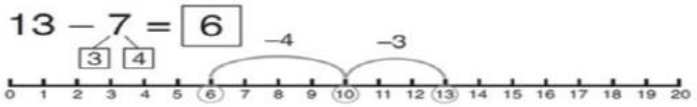
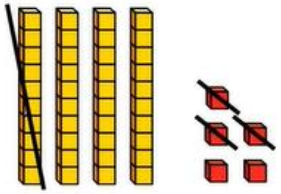
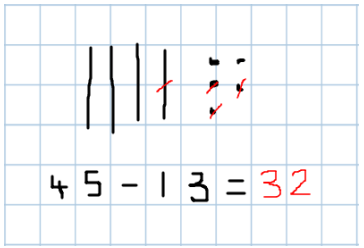
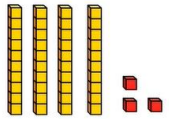
If 10 is the whole and 6 is one of the parts. What is the other part?

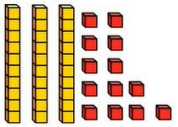
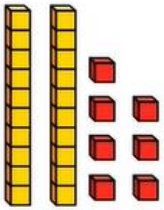
10 - 6 =</td>
<td>Use a pictorial representation of objects to show the part part whole model.

  </td>
<td> 

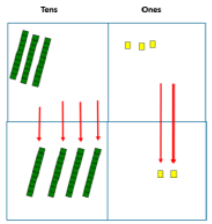
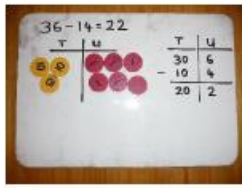
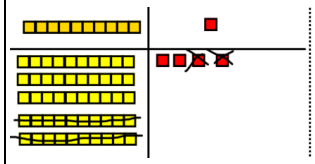
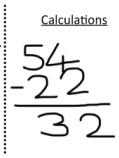
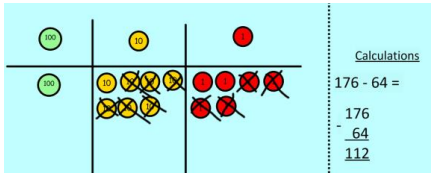
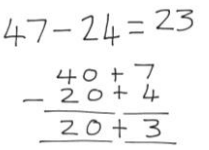
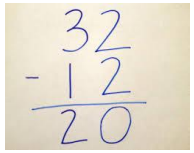
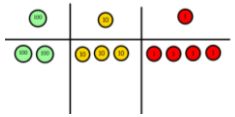
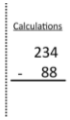
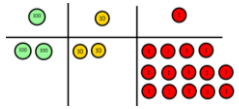
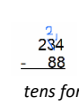
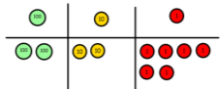
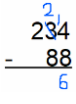
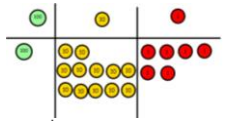
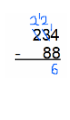
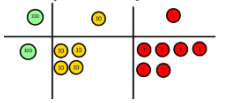
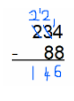
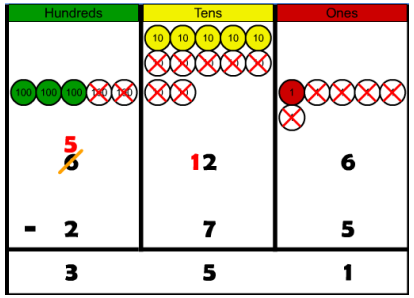
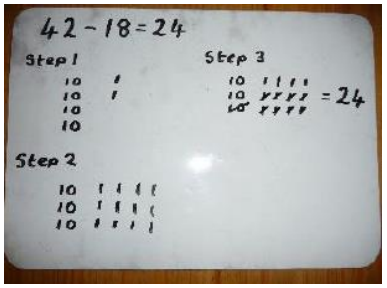
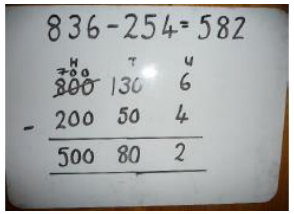
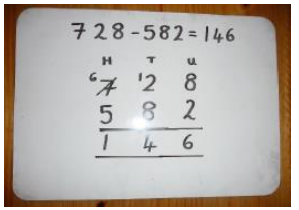
Move to using numbers within the part whole model.</td>
</tr>
</table>

Year 2 - Subtraction

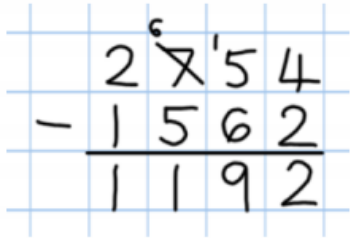
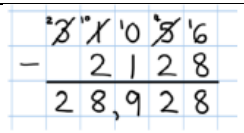
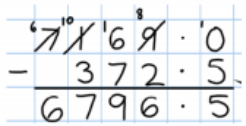
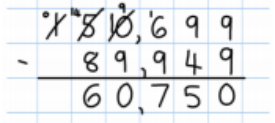
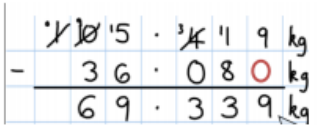
Objective and Strategies	Concrete	Pictorial	Abstract
Using known facts		 Children draw represenations to represent , H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Make 10	14 – 9 =  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?
Subtracting 2 digit numbers (no regrouping)	Use dienes to support with subtraction. 45 – 13 = 32 Create the number you are subtracting from using the dienes.  Ensure you only create the number you are subtracting.	45 – 13 = 32 40 – 10 = 30 5 – 3 = 2 	Children to use their knowledge of partitioning to support. 45 – 13 = 32
Subtracting 2 digit numbers (regrouping)	Use dienes to support with subtraction.  43 – 16 =		

	 Children to exchange 1 ten for ten ones. 43 − 16 =  Children to subtract the ones first followed by the tens. 43 − 16 = 27		

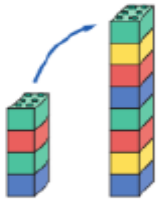
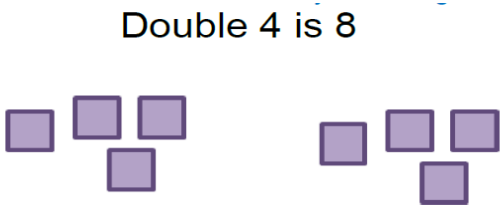
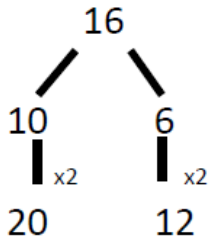
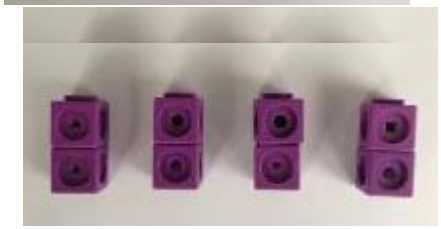
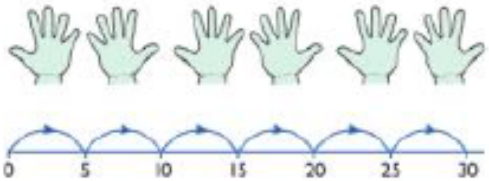
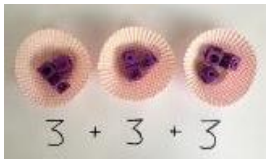
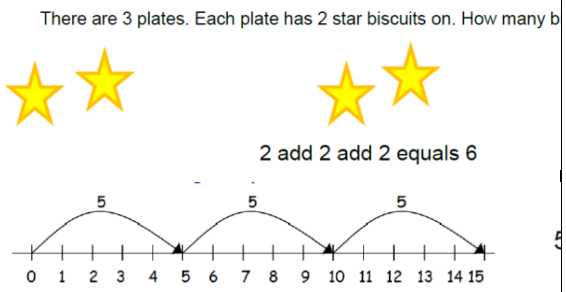
Year 3 - Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Column method without regrouping	 Use dienes to make the bigger number then take the smaller number away. 75- 42 =  Show how you partition numbers to subtract. Again make the larger number first.	  Draw the dienes or place value counters alongside the written calculation to help to show working. 	 This will lead to a clear written column subtraction. 
Column method with regrouping	Use dienes to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters   *Start with the ones, can I take away 8 from 4 easily? No, I need to exchange one of my ten ones.*   Now I can subtract my ones.   Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.   Now I can take away eight tens and complete my subtraction   Show 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.	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.  When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.	Children can start their formal written method by partitioning the number into clear place value columns.  Moving forward the children use a more compact method. 

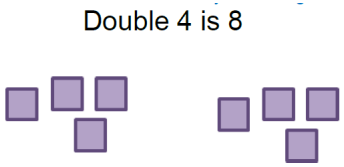
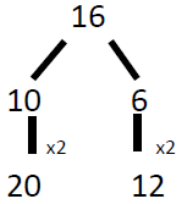
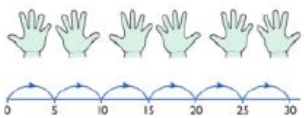
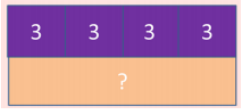
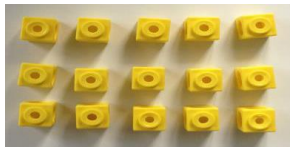
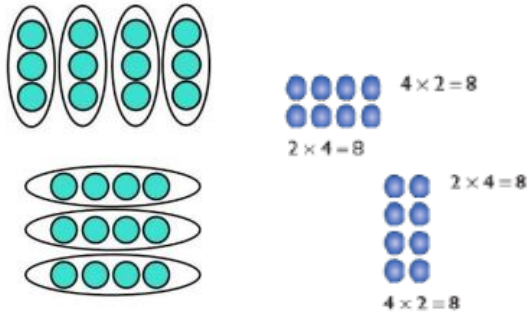
Year 4-6 - Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Column method Year 4 – up to 4 digits (Introduce decimal notation through context of money)	See Year 3 method	See Year 3 method	Ensure the language of exchaninging is used throughout. 
Column method Year 5 – at least 4 digits (Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal.	See Year 3 method	See year 3 method	 Use zeros for place-holders. 
Column method Year 6 – subtract with increasingly large, complex numbers and decimal values .	See Year 3 method	See Year 3 method	 

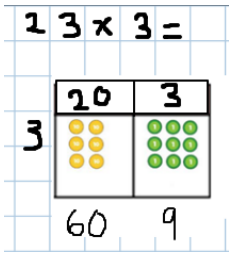
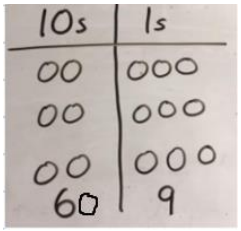
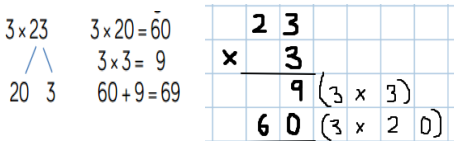
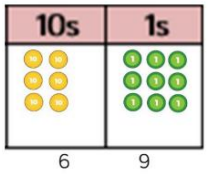
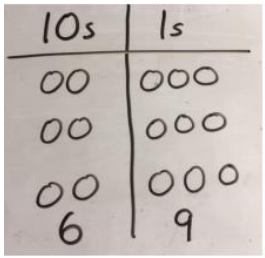
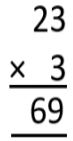
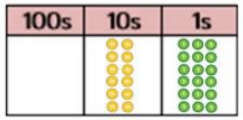
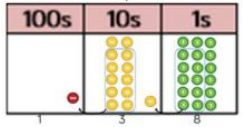
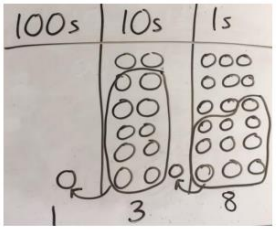
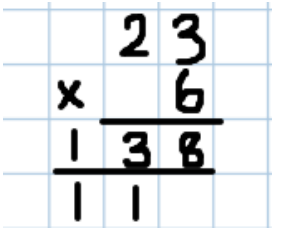
Year 1 – Multiplication

Doubling	Use practical activities to show how to double a number.  EYFS will use this method	Draw pictures to show how to double a number.  EYFS will use this method	 Partition a number and then double each part before recombining it back together.
Counting in multiples	  Count in multiples supported by concrete objects in equal groups	 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, 25 , 30
Repeated addition	   Use different objects to add equal groups.	 	Write addition sentences to describe objects and pictures. 

Year 2 – Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number.  	Draw pictures to show how to double a number.  	Partition a number and then double each part before recombining it back together. 
Counting in multiples (2,3,4,5,10 from 0) (repeated addition)	Count in multiples supported by concrete objects in equal groups.  Children may use their fingers as they count in equal groups.  2 + 2 + 2 + 2 = 8	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, 25 , 30 Only use multiplication symbol once introduced 4 × 3 = □
Arrays- showing commutativity	Create arrays using counters/ cubes to show multiplication sentences.  	Use representations of arrays to show different calculations and explore commutativity  Link arrays to area of rectangles.	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

Year 3 – Multiplication

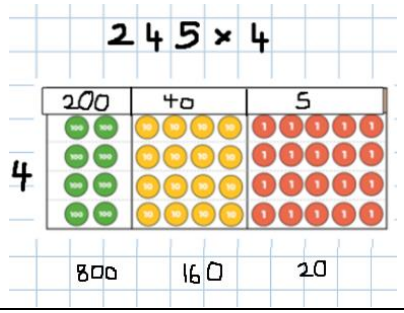
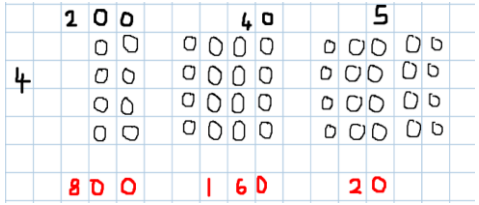
Objective and Strategies	Concrete	Pictorial	Abstract
Expanded column multiplication Additional step added to support understanding	Place value counters or dienes can be used. Children will repeated addtion to support understanding. Emphasis on paritioning. Use place value grids (in grid method format) to support understanding 23 x 3 = 	Children can draw counters to support their understanding.  x | 20 | 3 3 | 60 | 9	Children to record what it is they are doing to show understanding. Start by partitiong the numbers and showing the separate calculations.  When children write down answer in expanded method, ensure they are starting from the ones. Moving right to left on the grid.
Formal multiplication (no exchange) (2 digit by 1 digit)	Place value counters or dienes can be used. Children will repeated addtion to support understanding. Continue to set out counters in place value grids. 23 x 3 = 	Children can draw counters to support their understanding. 	ensure concept of palce value is secured before progressing onto this step. 
Formal multiplication (with exchange -2 digit by 1 digit)	Exchanging involved. Always start at the ones. 6 x 23 =  Start at the ones and add the total amount 	Children to represent their understanding using drawings. 	Write mutliplication question and answer in the formal method. 

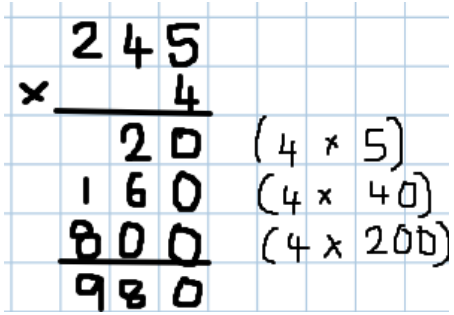
Year 4 – Multiplication

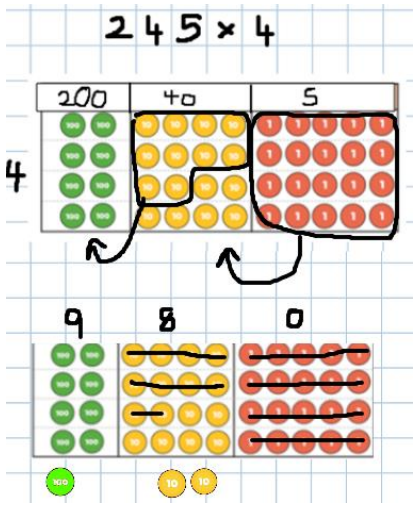
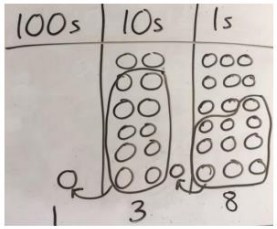
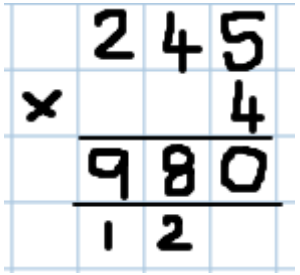
<table>
<tr><th>Objective and Strategies</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td>Expanded formal multiplication

(3-digit by 1- digit)

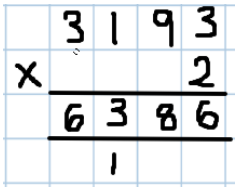
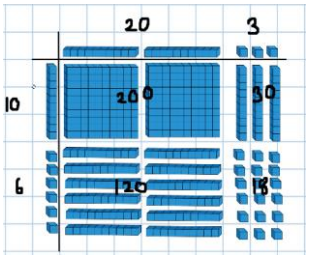
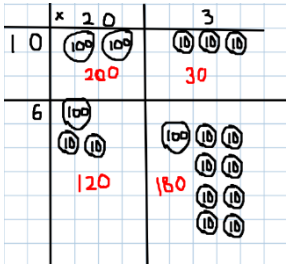
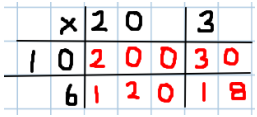
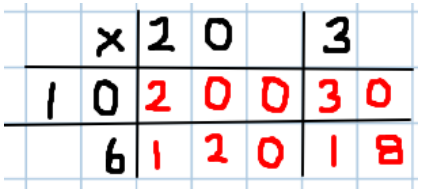
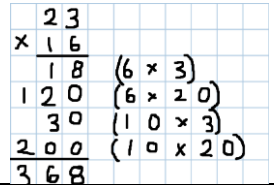
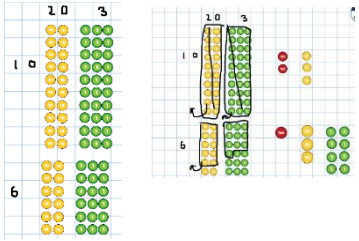
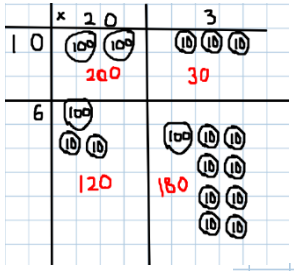
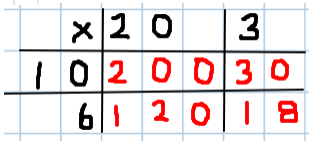
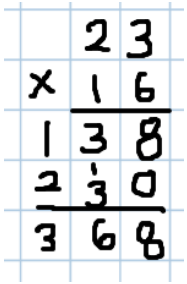
Additional step added to support understanding</td>
<td>Children can continue to be supported by place value counters at the stage of multiplication. Emphasis on partitioning by setting out in a grid format.
Always start by multplying the ones first and note down their answer each time (this will support formal method).
Show the link to arrays

245 x 4 =
 
</td>
<td>Children can draw place value counters to support understanding.
 

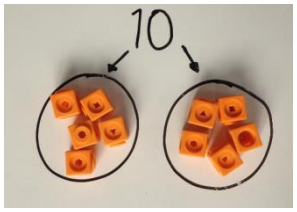
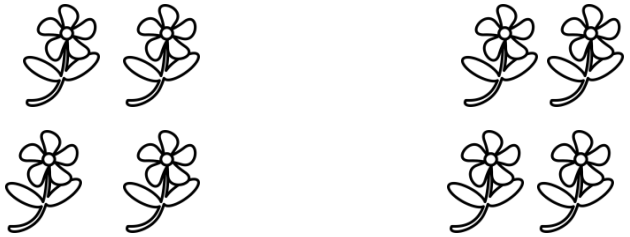
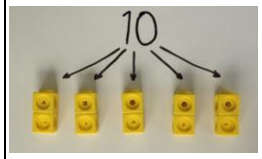
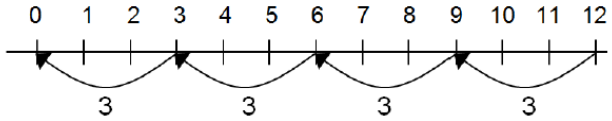
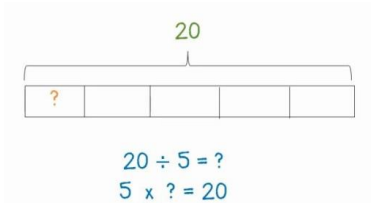
<table>
<tr><td>x</td><td>200</td><td>40</td><td>5</td></tr>
<tr><td>4</td><td>800</td><td>160</td><td>20</td></tr>
</table></td>
<td>This step will support children understand the place value importance in the formal method.
When children write down answer in expanded method, ensure they are starting from the ones. Moving right to left on the grid.
 
</td>
</tr>
<tr>
<td>Formal multiplication (short)

3-digit by 1-digit</td>
<td>Children use place value counters to support. Start at the ones and exchange if necessary.
 
</td>
<td>Children can draw place value counters to support understanding.
 
</td>
<td> 
</td>
</tr>
</table>

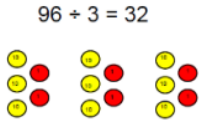
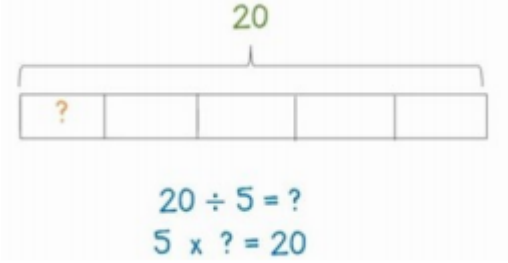
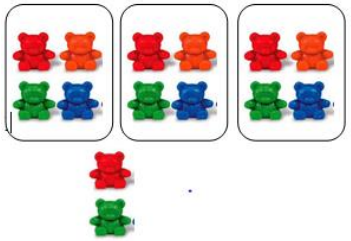
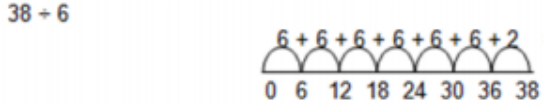
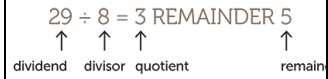
Year 5/6 - Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Formal multiplication (short) Year 5 4 digit by 1 digit	See Year 4 method	See Year 4 method	
Expanded formal multiplication (long) Year 5 2 digit by 2 digit	Place value counters or dienes can be used. Children will use apply knowledge of times table to support. Emphasis on partitioning and link to arrays. 	Children can draw representations to support alongside written numbers in grid format.  Children will exchange counters accordingly. 	 When children write down answer in expanded method, ensure they are starting from the ones. Eg 6 x 3, 6 x 20. If it helps, children can write out what they are solving next to their answer. Emphasise link between grid method and expanded formal method. 
Formal multiplication (long) Year 5/6 2-digit by 3-digit 2-digit by 4-digit .	Encourage children to partition the numbers and solve each part following the same structure as the formal method(start with 6 x 23)  More complexed questions: Children may still choose to use manipulatives with the corresponding long multiplication modelled alongside.	 Children may want to refer back to the grid method to help note calculations when solving more complex numbers. 	Children may jot notes on the side solving the question in smaller steps. Eg 23 x 6, 23 x 6. 

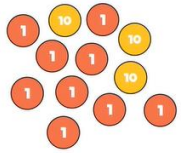
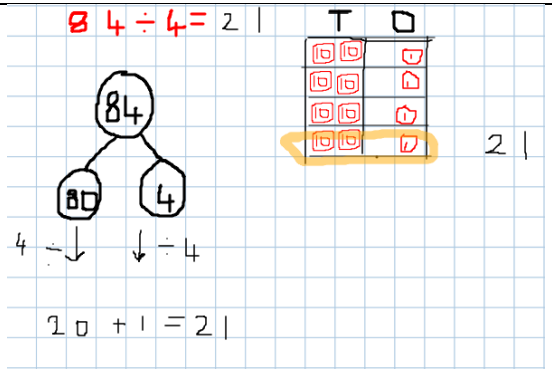
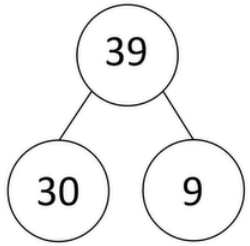
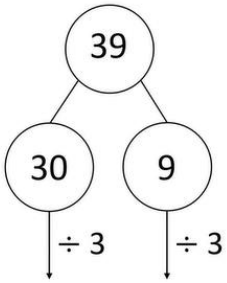
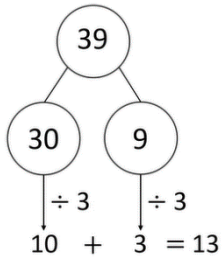
Year 1 and 2 – Division

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 I have 10 cubes, can you share them equally in 2 groups?  EYFS, Year 1 and Year 2 will use this method	Children use pictures or shapes to share quantities.  Year 1 – using pictorial representations no symbol *8 flowers shared into 2 equal groups* Year 2 – using pictorial representations alongisde statements and division symbol *8 flowers shared into 2 equal groups* 8 ÷ 2 = 4	Year 1 Share 9 buns between three people. Year 2 (use of division symbol) 9 ÷ 3 = 3
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.   Year 1 and Year 2 will use this method	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  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.  Year 2 will use this method	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group? Year 2 will use this method

Year 3 – Division

Objective and Strategies	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to support undertstandin  24 divided into groups of 6 = 4  *It is important children divide the tens first then the ones. Children will progress onto exchanging.*	Continue to use the bar model to support division problems. Children make the link with multiplciation to support. 	How many groups of 6 in 24? 24 ÷ 6 = 4
Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 

Year 4 – Division

Objective and Strategies	Concrete	Pictorial	Abstract
Using known facts (whole part model and place value grids) Year 4 Up to 3-digit by 1-digit	Begin by making the number you are dividing (dividend) using place value counters. 39 ÷ 3 =   Use a place value grid that has the same amount of rows as the number you are dividing by (divisor) Share out the counters, starting with the tens followed by the ones. Each row there is 1 ten and 3 ones showing 13 in each group.  	 Children to draw place value counters and place value grids.	Parition your number into parts. 39 ÷ 3 =  Divide each part by the divisor.   Add the two amounts together.

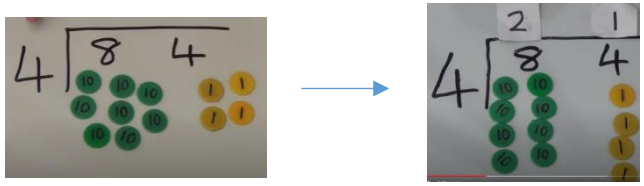
Year 5 – Division

Short division (no reminders and reminders)

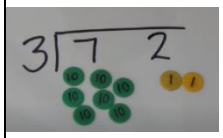
Year 5
Up to 4-digit by 1-digit

No exchange

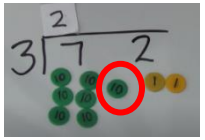
Begin with questions involving no exchange.
Children place counters into groups below. Always start with the largest place value.



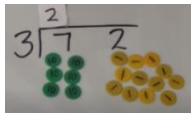
Involving exchange



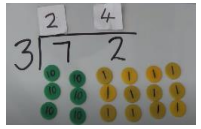
Children start with the largest place value.
' We can put 3 tens in each group and have 1 ten left over'



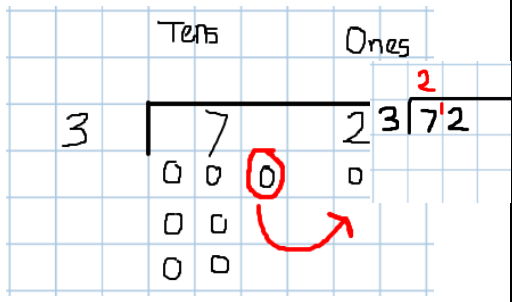
' I am going to exchange 1 ten for 10 ones'

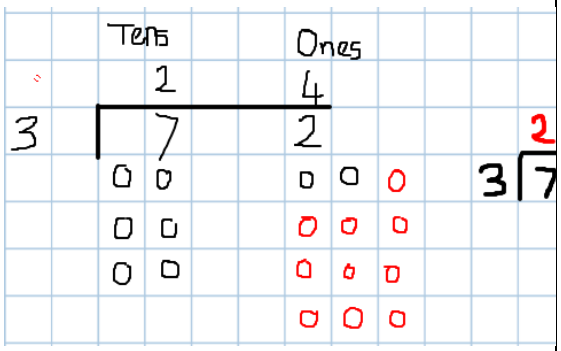


'We can put 3 ones into each group'.
(Note the remainders if it applies)

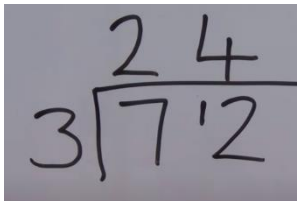


Children can draw place value counters to support understanding.
Draw pictures alongside short division.



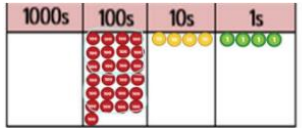
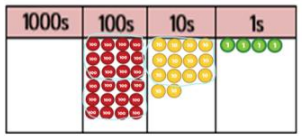
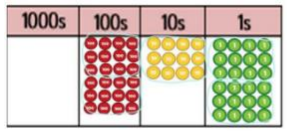


Begin with divisions that divide equally with no remainder



List the reminder if it applies.

Year 6 – Division

Objective and Strategies	Concrete	Pictorial	Abstract
Short division Up to 4 digit by 2 digit	See Year 5 method Focus on the grouping structure when dividing. Children can list the mutlples of the divisor (number they are dividing by)	See Year 5 method	Finally move into $$\begin{array}{r} 1\ 4\ .\ 6 \\ \hline 3\ 5 \overline{)\ 5\ 1\ 1\ .\ 0} \\ \quad\ 16\quad\ 21 \end{array}$$ decimal places to divide the total accurately.
Long division Up to 4 digit by 2 digit	Children can use place value counters to support their understanding. 2544 ÷ 12  We can't group 2 thousands into groups of 12 so will exchange them.  We can group 24 hundreds into groups of 12 which leaves with 1 hundred. $$\begin{array}{r} 0\,2 \\ \hline 12 \overline{)\ 2544} \\ 24 \\ \hline 1 \end{array}$$  After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens. $$\begin{array}{r} 0\,2\,1 \\ \hline 12 \overline{)\ 2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$  After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder. $$\begin{array}{r} 0\,2\,1\,2 \\ \hline 12 \overline{)\ 2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$	Jottings can be made to support understanding.	Encourage children to list multiples to support calculations $$\begin{array}{rrr} & & 0\ 3\ 6 \\ \hline 1\ 2 & \overline{)\ 4\ 3\ 2} & \\ -\ & 3\ 6\ 0 & (\times 30) \\ \hline & 7\ 2 & \\ -\ & 7\ 2 & (\times 6) \\ \hline & 0 & \end{array}$$