The Horsell Village School

Progression through Calculation Guidance
September 2022

This policy supports the White Rose maths scheme used throughout the school. Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum. This calculation policy should be used to support children to develop a deep understanding of number and calculation. This policy as 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.

Or long-term aim is for children to be able to select and efficient method (whether this be mental or written) that is appropriate for the given task. They will do this by always asking themselves:

"Can I do this in my head?"

"Can I do this in my head using drawings or jottings?"

"Do I need to use a pencil and paper?"

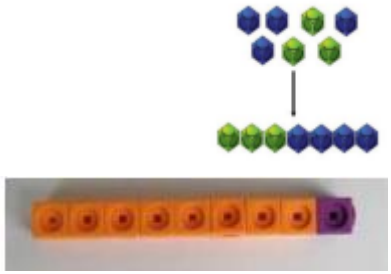
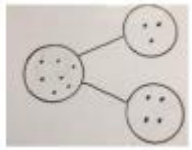
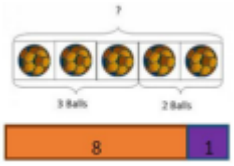
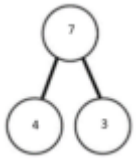
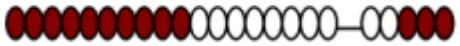
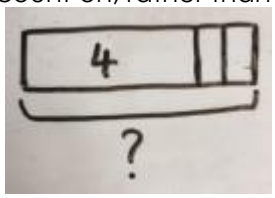
	EYFS	Year 1	Year 2
Addition	Combining two parts to make a whole - Part whole model Understand one more concept Composition of numbers to 10 Five and tens frames	Part whole model Regrouping to make 10 using ten frames	Adding three single digits Use of base 10 to combine two numbers
Subtraction	Understand one less concept Composition of numbers to 10	Counting back Taking away ones Find the difference Part whole model Make 10 using the tens frame	Counting back Find the difference Part whole model Make 10 Use of base 10
Multiplication	Explore doubles	Recognising and making equal groups Doubling Counting in multiples using concrete materials	Arrays – showing commutative multiplication Repeated addition
Division	Explore how quantities can be distributed equally	Sharing objects into groups Division as grouping	Division as grouping Division within arrays – linking to multiplication Repeated subtraction

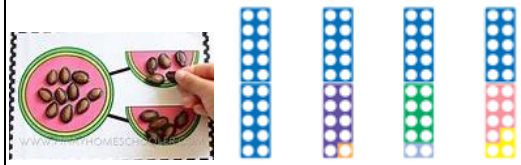
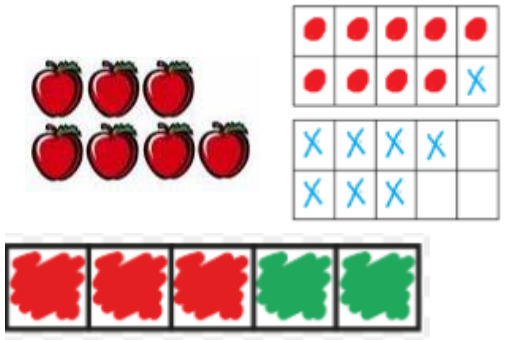
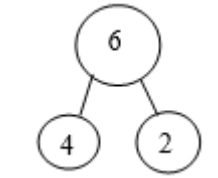
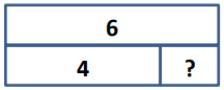
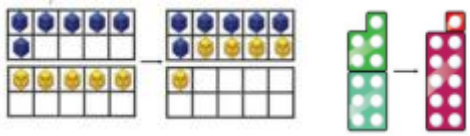
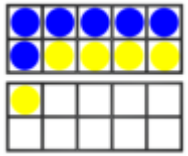
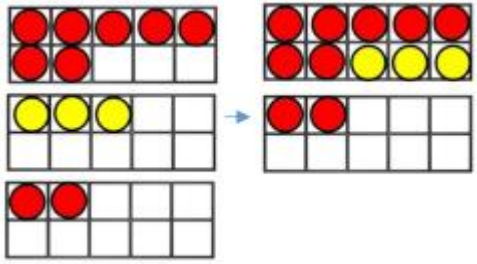
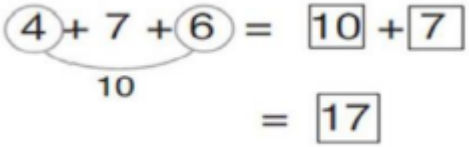
Addition

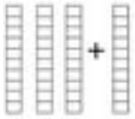
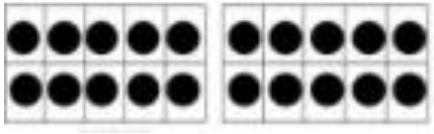
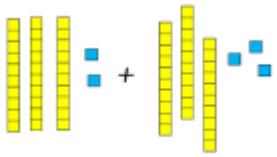
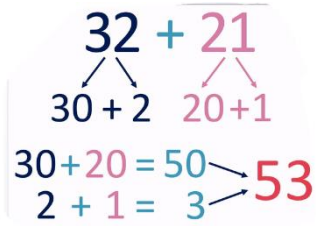
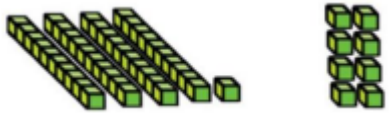
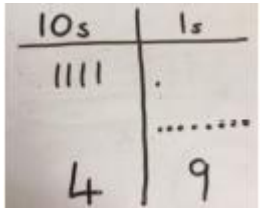
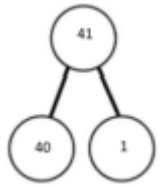
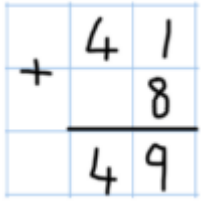
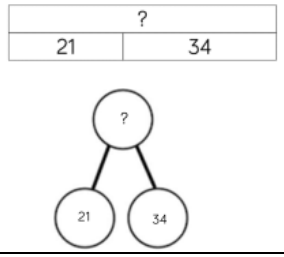
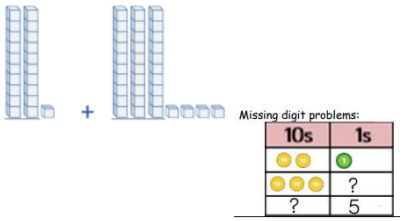
Key language: sum, total, parts, wholes, plus, add, altogether, more, 'is equal to', 'is the same as'.

Early Number Sense and Early Addition

- Early counting begins with children being able to count using 1:1 correspondence. They will then be able to count out, accurately, a given number of objects
- Children need to understand that number symbols represent a particular quantity (eg. The fiveness of 5)
- Children need to be secure in the concept of subitising (don't count, say the amount)

	Concrete	Pictorial	Abstract
Combining two parts to make a whole – part whole model	Use other resources too eg. shells, bears, cars 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.   Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven.  Ensure calculations are also done where the "answer" is in different places. Eg. □ = 4 + 3
Starting at the bigger number and counting on.	Use cubes or Numicon   18 + 5 = 23 	A bar model which encourages the children to count on, rather than count all. 	The abstract number track: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4+2 = 

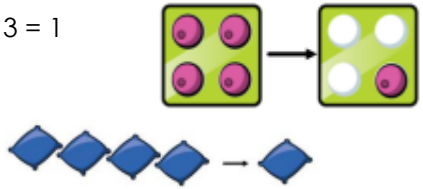
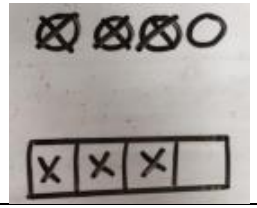
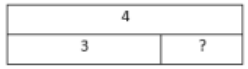
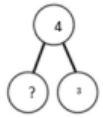
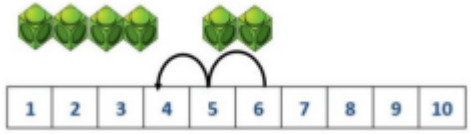
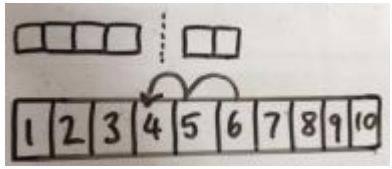
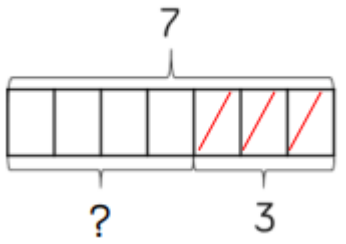
Number bonds up to 10 then up to 20 (number bonds for all numbers up to 20)	Using concrete materials children explore number bonds. 	Children represent the addition using pictures/representations. 	Children to represent the 'bond' with numerals. 5+3=8 3+5=8 8-5=3 8-3=5  
Bridging 10 using tens frame. *This is an essential skill for column addition later*	Using ten frames and counters/cubes or using Numicon. 6+5 = 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality. Eg. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
Adding three single digits	Using ten frames and counters/cubes or using Numicon 7 + 3 + 2 = leads to 10+2 = 	Children to draw the tens frame and counters/cubes. 7 + 3 + 2 = 	Combine the two numbers that make or bridge 10 and then add on the third number. 

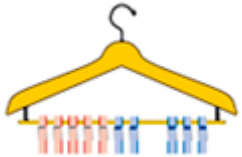
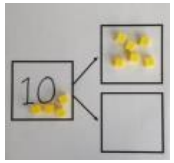
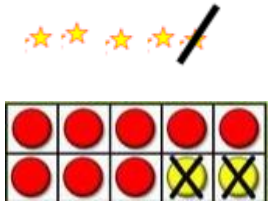
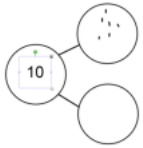
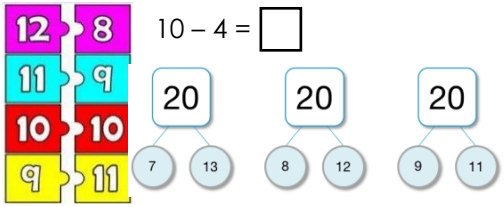
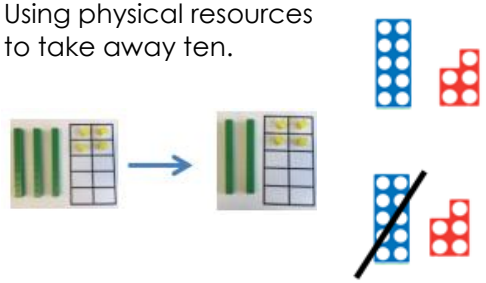
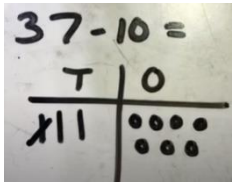
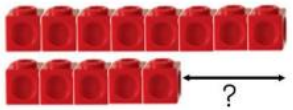
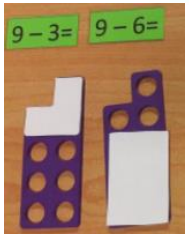
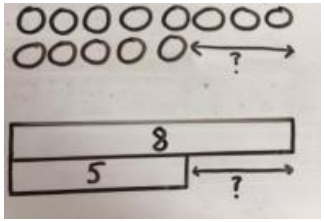
Adding 10 more	  Using Numicon or dienes.	Children to draw the counters/cubes  	15 + 10 = 
Adding - partitioning	32 + 33 = 	Drawing tens and ones: 32 + 33 = 	
Adding 2-digit number and a single digit number.	Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 (eg. lines for tens and dots/crosses for ones) 	41 + 8 =  1 + 8 = 9 40 + 9 = 49 
Conceptual variation: different ways to ask children to solve 21+34			
	Word problems: In year 2 there are 21 children and in year 1 there are 34 children. How many children in total? 21+34 = 55. Prove it	21 + 34 = 20 + 30 = 50 1 + 4 = 5 50 + 5 = 55 21 + 34 =	

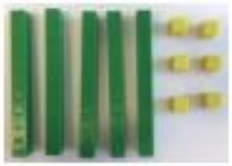
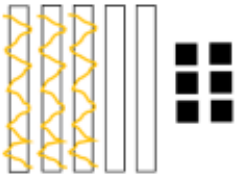
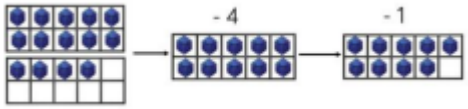
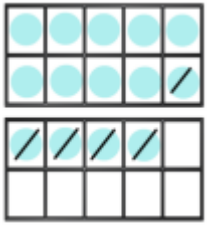
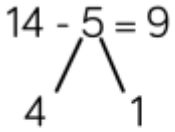
Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease

- Early subtractions begins with children being able to count using 1:1 correspondence. They will need to count forwards and backwards to 10.
- Children need to understand that number symbols represent a particular quantity (eg. The fiveness of 5)
- Children need to be secure in the concept of subitising (don't count, say the amount)

	Concrete	Pictorial	Abstract
Taking away ones *Physically taking away and removing objects from a whole*	Tens frames, Numicon, cubes and other items such as beanbags could be used. 4 - 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4 – 3 = □ = 4 - 1  
Counting back	Using number lines or number tracks. Children start with 6 and count back 2. 6 – 2 = 4  	Children to represent what they see pictorially eg. 	Put 7 in your head, count back 3. What number are you at? Use your fingers to help. 

Number bonds to 10 then to 20. (relate to the inverse of addition)	Using knowledge of addition of two groups.   	Using pictorial methods of crossing out for subtraction with number bonds, use inverse of addition  	Use knowledge of number bonds to work out subtraction number sentence. 
Subtract 10	Using physical resources to take away ten. 	Draw the 2 digit number to cross out the ten. 	**34 – 10 = 24** *Using bonds of 3 – 1 = 2*
Finding the difference	Using cubes, Numicon or Cuisenaire rods, other objects can also be used. Calculate the difference between 8 and 5.  	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 – 6 = 8 – 5 = 7 – 4 have the same difference

Subtract from any 2-digit number, a multiple of ten.	56 – 30 =  *Take away 3 tens*	56 – 30 = 	56 – 30 = *Using bonds*: 76 – 20 = 56 because 7 – 2 = 5
Subtract a 2-digit number from a 2 digit number.	78 – 34 =  *Take three tens and four ones away*	78 – 34 = 	78 – 34 = 44 because 7 – 3 = 4 and 8 – 4 = 4 95 – 43 = 52 because 9 – 4 = 5 and 5 – 3 = 2
Use partitioning to subtract any 1 digit number from any 2 digit number.	Using tens frames. 14-5 	Children to represent the ten frame pictorially and discuss what they did to make 10. 14-5 	Children to show how they can make 10 by partitioning the subtraction.  14 - 4 = 10 10 - 1 = 9

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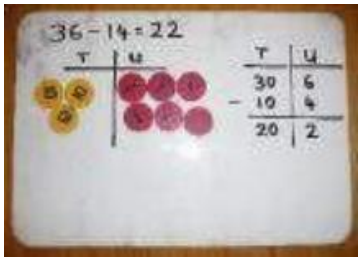
<td>Use partitioning to subtract any 2-digit number from any 2 digit number.</td>
<td> 
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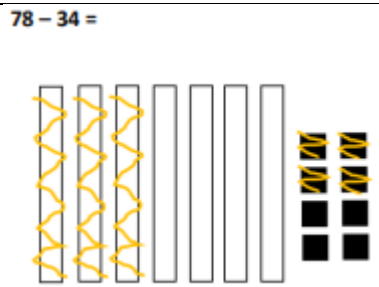
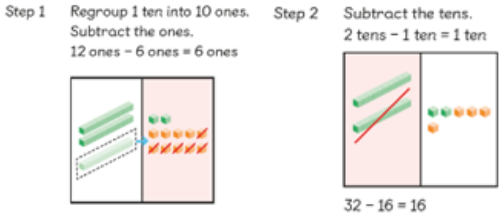
<td> 
</td>
<td>54 – 13 =
54 – 10 = 44
44 – 3 = 41</td>
</tr>
<tr>
<td>Use partitioning to subtract any 2-digit number from any 2-digit number - with regrouping</td>
<td> 
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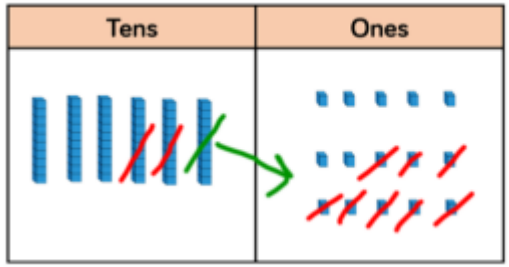
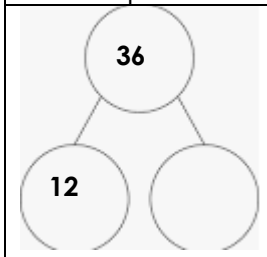
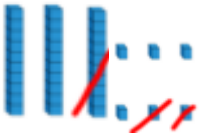
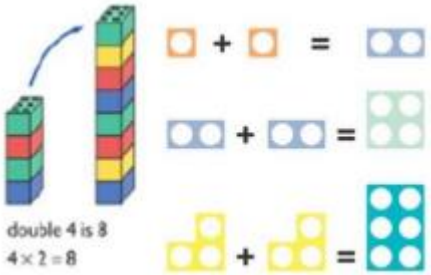
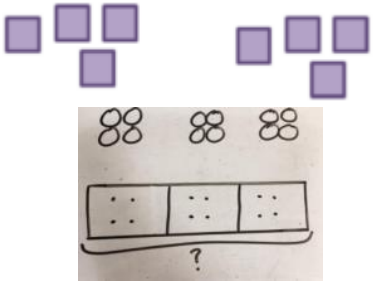
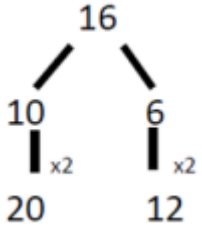
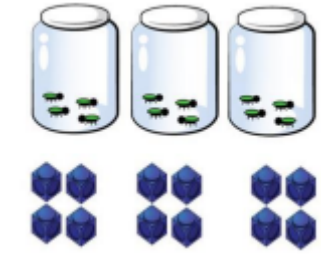
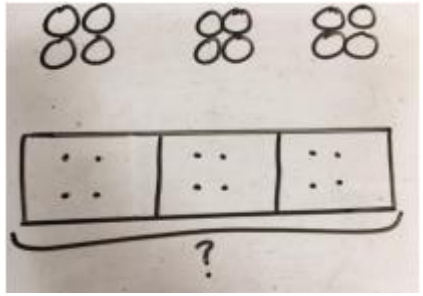
<td> 
</td>
<td>78 – 49 = 29

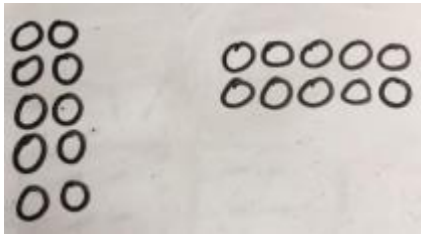
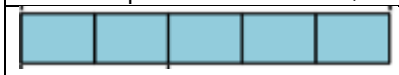
78 – 40 = 38
38 – 8 = 30
30 – 1 = 29</td>
</tr>
<tr>
<td colspan="4">Conceptual variation: different ways to ask children to solve 36 - 12</td>
</tr>
<tr>
<td> 
</td>
<td>Raj spent £36. Timmy spent £12.

How much more did Raj spend?

Calculate the difference between 36 and 12.</td>
<td>What is 12 less than 36?

36 – 12 =</td>
<td>  </td>
</tr>
</table>

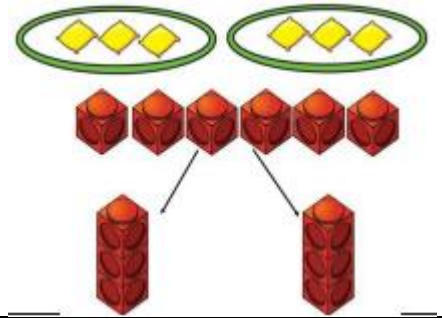
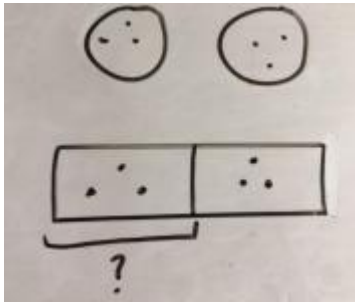
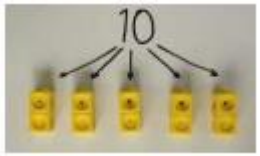
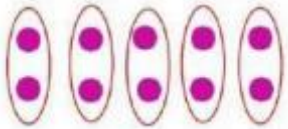
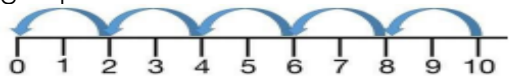
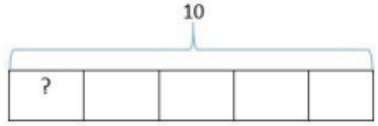
Multiplication			
Key language: double, times, multiplied by,, the product of, groups of, lots of, equal groups			
• Early multiplication begins with counting related groups of the same size in games and practical activities. • Children begin with early doubling (multiplying by 2)- represented with fingers, tens frames, Numicon, pictures.			
	Concrete	**Pictorial**	**Abstract**
Doubling	Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling.  	Children draw pictures to show how to double numbers. Double 4 is 8  	Partition a number and then double each part before recombining it back together. "Number Rockets"  = 32
Repeated addition Repeated grouping/repeated addition	3 x 4 = 12 4 + 4 + 4 = 12 There are 3 equal groups, with 4 in each group 	Children to represent the practical resources in a picture and use a bar model.  	3 x 4 = 12 3 + 3 + 3 + 3 = 12

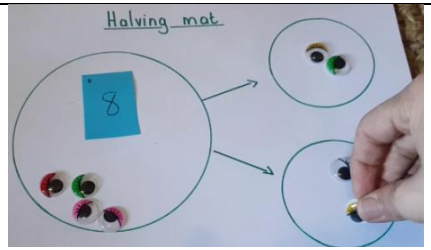
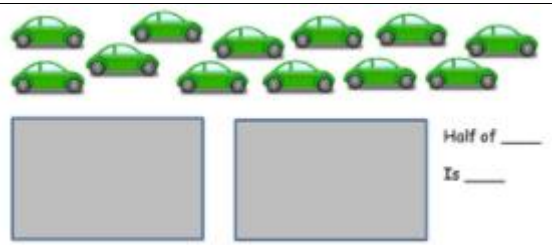
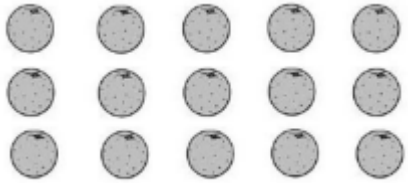
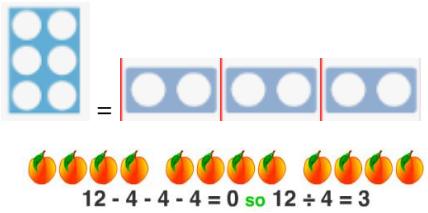
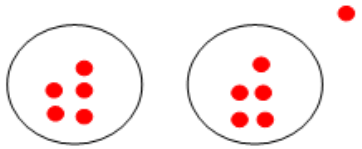
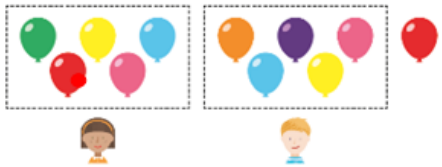
Counting in multiples (Counting on and back in steps of 2s, 5s and 10s.)	3 x 4 	Represent this pictorially eg: 	3 x 4 = 12
Use arrays to illustrate commutativity	Counters and other objects can also be used. 2 x 5 = 5 x 2  	Children to represent the arrays pictorially 	Children to be able to use an array to write a range of calculations eg. 10 = 2 x 5 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
Conceptual variation; different ways to ask children to solve 2 x 5			
	Mia had to swim 2 lengths, 5 times a week. How many lengths did she swim in one week? With counters, prove that 5 x 2 = 10	Find the product of 6 and 23 2 x 5 = ☐ = 2 x 5	 ☐ X ☐ =

Division

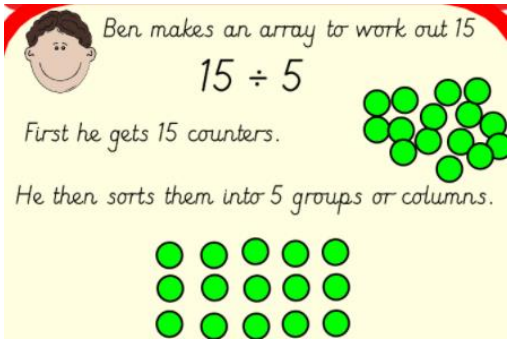
Key language: share, group, divide, divided by, half

- Division begins with children counting related groups of the same size in games and practical activities – use of rhymes and counting songs

	Concrete	Pictorial	Abstract
Sharing	Using a range of resources. 6 ÷ 2 	Represent the sharing pictorially 	6 ÷ 2 = 3  Children should also be encouraged to use their 2 times-tables facts.
Grouping (Counting on and back in steps of 2, 5, and 10)	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	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.  10 ÷ 5 = ? 5 x ? = 10	10 ÷ 5 = 2 Divide 10 into 5 groups. How many in each group?

Halving (dividing by 2)			Halve 24 *or* 24 ÷ 2 = *or* half of 24 =
Division with arrays – related to multiplication	Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15 	Draw an array and use lines to split the array into groups to make multiplication and division sentences 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4
Repeated subtraction – counting o and back in steps of 2, 5 and 10	6 ÷ 2 	Children to represent repeated subtraction pictorially 	10 ÷ 2 = 10 – 2 – 2 – 2 – 2 – 2 = 0
Dividing with remainders – counting on and back in steps of 2, 5, 10	11 ÷ 2 = 5 remainder 1 	11 ÷ 2 = 5 remainder 1 	11 ÷ 2 = 5 remainder 1

<table>
<tr><td colspan="4">Conceptual Variation; different ways to ask children to solve 15 ÷ 5</td></tr>
<tr>
<td>Using the part whole model below, how can you divide 15 by 5?</td>
<td>I have £15 and share it equally between 5 bank accounts. How much will be in each account?

15 pupils need to be put into 5 groups. How many will be in each group?</td>
<td>15 ÷ 5 =
 
</td>
<td>
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<tr><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr>
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</td>
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