Abbots Farm Infant School

Abbots Farm Preschool

Calculation Policy

November 2021

Review by November 2023

How to use the policy:

This mathematics policy is a guide for all staff and parents at Abbots Farm Infant School. Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used. For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

Concrete, Pictorial, Abstract (CPA)

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to **teaching** that develops a deep and sustainable understanding of maths in pupils. Children need to be exposed to all three representations to develop a rich, broad and deeper understanding of Mathematics.

Concrete – Concrete manipulatives are fundamental to the (CPA) approach. All children, regardless of age/stage need the opportunity to 'play' with concrete manipulatives to develop a deeper understanding of key concepts taught, building strong foundations.
Pictorial – alongside this, children should begin to make connections between concrete and pictorial representations. These representations can then be used to help reason and solve problems.
Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

<u>EYFS:</u>

Early Years statutory requirements relating to number:

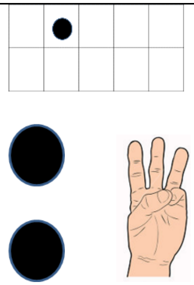
ELG:11 Number

- Have a deep understanding of number to 10, including the composition of each number;
- Subitise (recognise quantities without counting) up to 5;
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

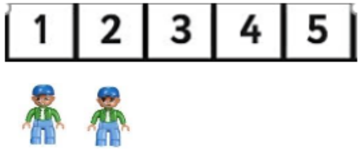
ELG: 12 Numerical Patterns

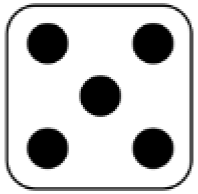
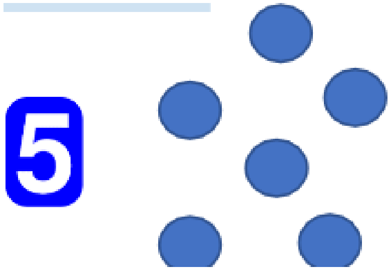
- Verbally count beyond 20, recognising the pattern of the counting system;
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity;
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

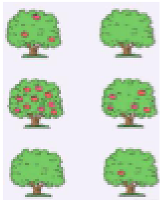
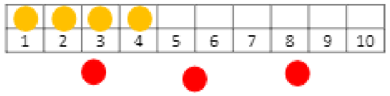
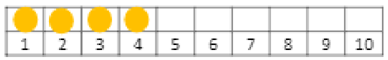
Addition

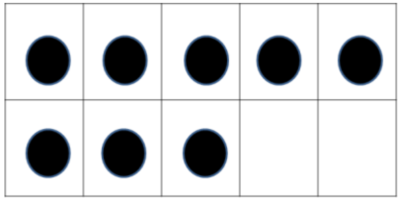
CONCEPT (small steps)	CONCRETE (The 'doing' stage)	PICTORIAL (The 'seeing' stage)	ABSTRACT (the 'abstract' stage. Symbols and numbers are used)	REASONING/ MASTERY
Cardinal (fourness of four)	Children use a range of structured and unstructured apparatus, plus natural resources, to create different number values. 	Children recognise different number values that are presented in pictorial forms. 	Children are asked a range of questions that allow them to show an application of understanding related to cardinality, e.g. Can you find a collection of...[objects]...to represent six? Can you show me six fingers? Can you make some marks that show me that number?	What is the same/ different about different collections of __ objects? I know this is 4 because ....
Subitising	Children replicate a range of physical representations, which they then verbally interpret without a need to count objects.  	 Drawing out number representations in same pattern Numicon is laid out. Knowing that a tally 'gate' means 5. Knowing in games that they have a certain number without having to count them.	Children need an image to be able to subitise.	How do you know that it is that number? (Asking children to explain numbers that they can see) Is there another way that you could make that number?

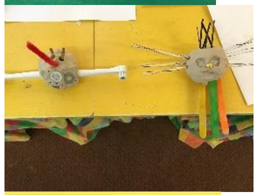
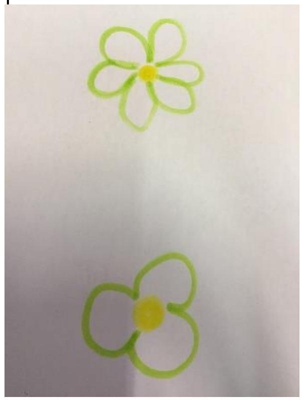
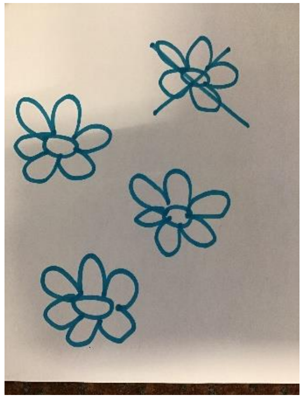
				
Equality	Children use physical equipment when learning about equality(also inequality), and also use related language, e.g. 'the same as,' 'more than' and less than.'    	Children use pictorial representations to show equality or values that are 'the same as,' whilst also verbalising their reasoning,  	Recording different ways of making a number using a tens frame	How many different ways can you show me the number...? How do you know if you have found all of the ways?

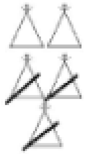
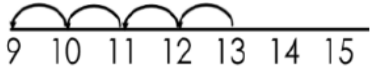
Conservation of number	Children explore whether the number of cubes stay the same or change when they are moved within a shape.  Pupils also count dolls and then put them in different rooms before re-counting to check the total. Hopefully they decide that if nobody has left and nobody has arrived, then it must be the same total even if some of the dolls have moved rooms. 	Pupils work with visual reminders of their concrete experiences–to check how their understanding around conservation of number has changed.   	Children are provided with opportunities to further explore and prove their thinking. E.g. They may be asked to put a total of dolls in the toy house and then move them around. In order to prove it is still the same total, they can take the dolls and put them onto a number track, whilst also applying their understanding about the cardinal principle.  	What is the same? What is different? How do you know that the number is still the same? How could I change that number?

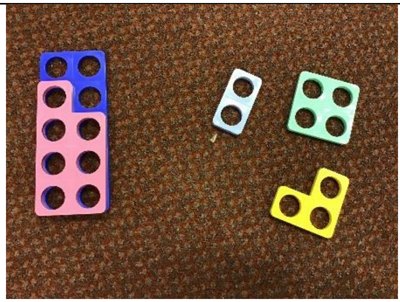
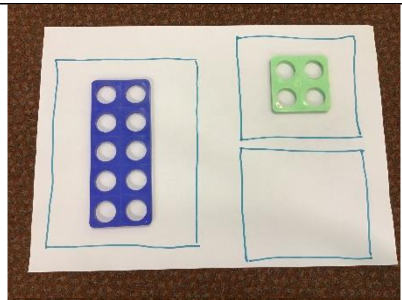
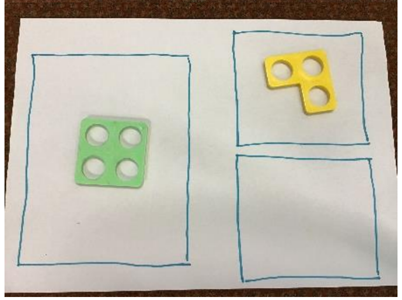
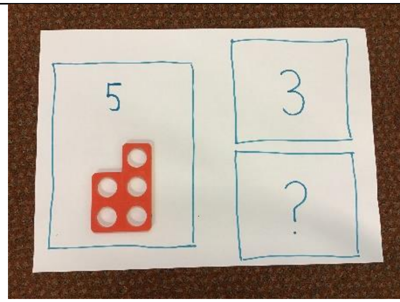
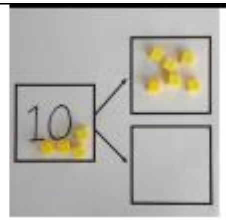
1-1 correspondence	Children count various physical objectsby partitioning a group and finally recombining.  Children write a number in each part of a muffin tin and then put the appropriate number of buttons in each section.  	Children count the dots on the face of a pictorial dice.  Children match number cards to pictures of the equal numbers of buttons.  	Children draw dots to match the number of holes that can be seen on a named Numicon shape.  Children cut out buttons equal to the number shown on a number card.  Playing dominoes 	Why can't it be.....?
Concept of zero	Children use physical equipment sorted into groups with some of the groups	Children use pictorial representations to see that you can have an amount	Children can be encouraged to represent written number	

	having no objects to represent Zero. They will also use equipment like dominoes discussing what it means when there are no dots represented 	that's called 'zero.' Pupils are encouraged to count different amounts of objects e.g. the number of apples of a tree, and circle the trees which have no apples. 	sentences by using images e.g. 5 = 0 +5  Pupils should be able to grasp the concept of zero to use within number sentences, e.g. 4 = 4 + 0 ...and verbalise..."I know that four is the same as four add zero."	
Counting on	Children use physical objects to learn the skill. For example, they count on from the larger value by using their fingers whilst pointing at each 'extra' dot on the second side of a domino.  In addition, pupils use counters on number tracks to rehearse the process of counting on.  	Children use a die to generate numbers and count on from pictorial representations of counters already positioned on a number track.   	Children apply their understanding of this skill by playing games such as 'snakes and ladders.' 	How do you know which is the biggest number? What number will come next? Prove it!

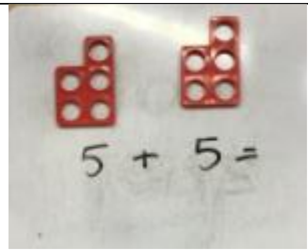
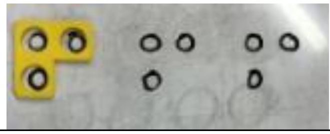
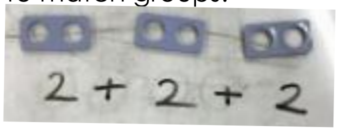
Subtraction				
CONCEPT (Small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Subitising	Children use a number grid or a piece of Numicon but leave one space empty. They begin to recognise that it "isn't 4 because it's got one less" repeat for different amounts. Children use two pieces of Numicon and lay them on top of one another and realise that " it isn't 5 because it's got one less" 	Children use pictorial representations, knowing that "it isn't 10 because it has 2 less" 		"I know I haven't got 4 because it is one less" "How do you know it's not..." "I know I haven't got 10 because 5 and 5 is 10 and I've got 5 and 4"
Conservation of number		Children use their finger to know how many they have counted back.	Children hold in their head their starting number and hold in their head how many they are counting back.	Children can see there are 4 teddies but then one is covered over and children tell you how many teddies there are still

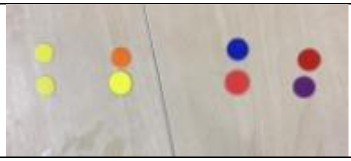
Compare quantities (less/Few)	Children compare different amounts in a variety of different play situations e.g. "I have less bricks than you", "have you got the same as me?"   	Children draw representations e.g. can you put lots of petals on your flower and can you put less on the other flower. 		How do you know there are less? Can you make yours less than mine?
Find/say 1 less	Children use objects and physically remove one object from their group. 	Have pictures of objects and children cross off one object to find one less. 	Children look at the numerals on a number line and know that "11 is one less than 12" 	What would my starting number be if I've now got 7 and I've already taken one away? How do you know that 11 is one less than 12?

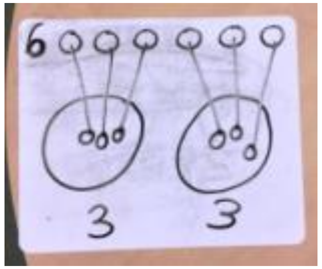
Taking away ones from a larger group and counting how many are left	Children have a set of objects and physically remove one.  	Children cross off the amount of objects being taken away and then count how many are left.  	Children read a sum and know what that sum means. $18 - 3 = 15$ 	This packet of biscuits had 10 in it now there are 6, how many have gone?
Counting back	Children use counters and count back as they move objects away from the group. 	Children pick a start number, place finger on starting number and move it backwards for each number that they say as they count back. 	Children pick a start number and draw one jump for each number they say as they count back. 	If you start with 15 and end up with 5, how many jumps backwards would you make? You are going to count backwards 5 jumps. Think of 3 starting numbers and the 3 numbers you would land on.
Part part whole	Children find which piece of Numicon fit into the space when layed on top of another piece. Children experiment with different pieces of Numicon	Children use Numicon. They see the 'whole', they are given one of the parts and then they find the missing part.	Children are given the 'whole' visually and with the numeral. Children are then given a 'part' as a numeral and they find the missing 'part' as a numeral.	If 10 is the whole and 6 is one of the parts what would the other part be?

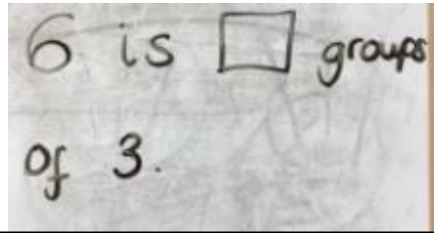
		 		

Multiplication				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
By the end of Reception, children are expected to understand the concept of doubling and to be able to double a number up to 10. Before doubling can be introduced, children need to have a secure knowledge of counting, number facts and addition in order to double. Children are then introduced to the concept of doubling through practical games and activities, including the use of the outdoor areas. Children act out 'doubling' by physically adding two equal groups together to find out the 'doubles' answer.				
Physically make two groups that have the same quantity	Children will practically make groups that are the same as somebody elses	Children will show a representation of these groups visually	Children will use mathematical resources to represent two groups that are the same and include numerals and symbols alongside these.	Asking questions such as which of these are doubles? How do you know?

	   			
Physically add two groups the same together to find the doubles answer	As the physical stage but adding the two groups together to find the end quantity.	As the physical stage but adding the two groups together to find the end quantity	As the physical stage but combing the two groups to find the end quantity and recording this numeral	If I have 10 what number have I doubled?
Repeated addition Pupils should apply skip counting to help find the totals of repeated additions.	Children put objects into groups of the same amount practically e.g. in 2's.	Children will draw out a visual representation of groups that are the same. 	Children will use practical resource but add numerals and symbols to match groups. 	How many groups of 2's are there in 10? If you have the number 12, how many different repeated groups can you make? (e.g. 2+2+2+2+2+2 or 3+3+3+3 or 4+4+4 or 6+6)

				If you have 20 which number can't you make repeated groups of?

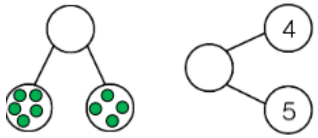
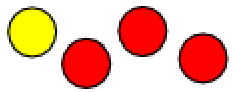
Division				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
By the end of Reception, children are expected to understand the concept of halving and sharing. Before this can be introduced, children need to have a secure knowledge of counting backwards, number facts and subtraction in order to halve and share. Children are then introduced to the concept of halving and sharing through practical games and activities. They act out 'halving and sharing' through activities such as sharing food for their Teddy Bear's Picnic, sharing resources equally to play a game. This is reinforced by opportunities provided in the outdoor area for the children to halve and share out objects such as building blocks, twigs etc.				
Understand concept 'same' get the same amount of objects/numeral etc	Same as top row in multiplication	Same as top row in multiplication	Same as top row in multiplication	Same as top row in multiplication
Practically share out objects starting with games, then between 2 and then moving to different amounts of people	Children will physically share out resources between themselves and one other person practially using language "one for you, one for me, etc" where they will share fairly.	Children will draw out a visual representation of their practical sharing. 	Children will represent sharing with a pictorial representation including numerals. 	What happens to how many you get when you share between more people? What happens if it's not fair? Can you share all numbers fairly?

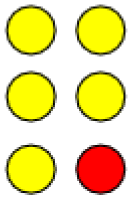
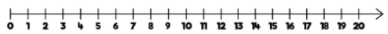
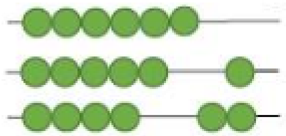
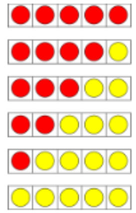
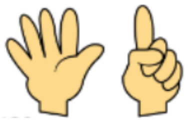
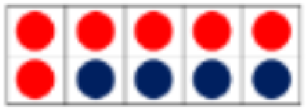
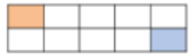
				
To begin to understand the relationship between double and half			Children will read a mathematical calculation and then show the inverse.  	How do you know? Can you show me? Why can it not be....?

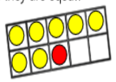
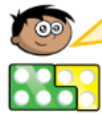
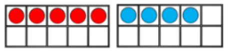
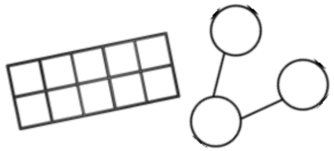
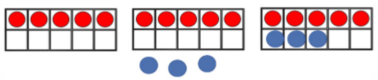
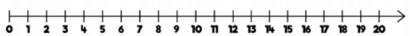
<u>Yr 1:</u>

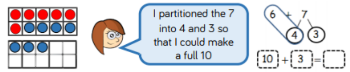
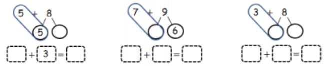
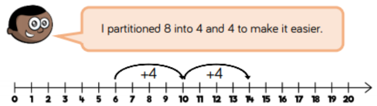
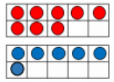
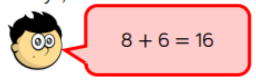
Year 1 statutory requirements relating to addition and subtraction:

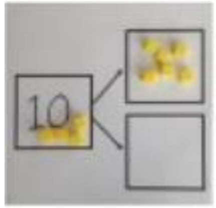
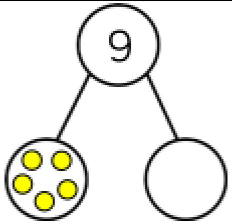
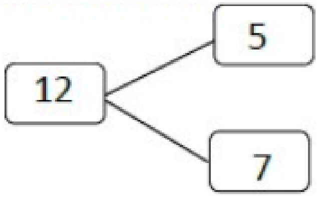
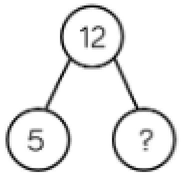
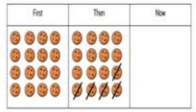
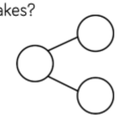
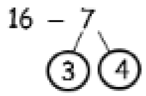
- read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including 0
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9

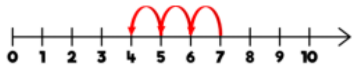
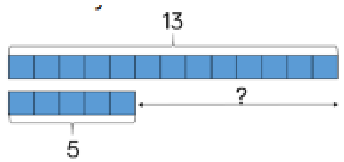
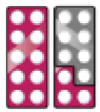
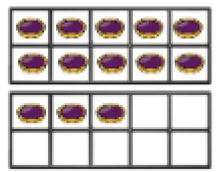
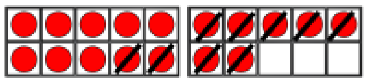
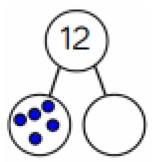
Addition				
CONCEPT (small steps)	**CONCRETE (The ‘doing’ stage)**	**PICTORIAL (The ‘seeing’ stage)**	**ABSTRACT (the ‘abstract’ stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Part whole model	Children to share a group of objects into 2 different groups.		Draw the part-whole model that represents the stem sentences: • A part is 4 • A part is 3 • The whole is 7	There are 6 animals.  How many different ways can you sort the animals? Complete a part-whole model for each way. Can you partition the animals into more than 2 groups?
Addition symbol	Writing and seeing it (magnetic sign) around different areas of the classroom.		$8 + 1 = \square$ $\square + \square = \square$	Using the numbers 0 – 9, how many ways can you fill in the boxes to make the calculation correct? You can only use each number once. $\square + \square = \square$ How many different calculations are there? What do you notice?

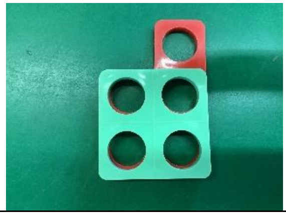
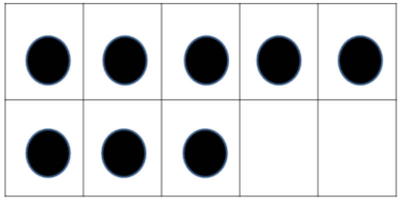
Fact families – addition facts	Use objects such as cubes to make different number families.	 	3 + 2 = 5 2 + 3 = 5 5 = 3 + 2 5 = 2 + 3	Use the number cards to make 4 addition sentences. 
Find number bonds for numbers within 10	Children use unifix to build groups of a give number.		5 = 3 + 2 5 = 4 + 1	Use 7 double sided counters.  How many different ways to make 7 can you find? Record your findings in number sentences.
Systematic number bonds for numbers within 10	Children to use equipement such as tens frames and bead strings to see the different		7 + 0 = 7 6 + 1 = 7 5 + 2 = 7 4 + 3 = 7	 5 = 5 + 0 5 = 4 + 1 _ = _ + _ _ = _ + _ _ = _ + _ _ = _ + _
Number bonds to 10	Children use practical equipment e.g.numicon, bead strings to find two numbers that total 10.  How many more fingers are needed to make 10?	 Use ten frames to complete number bonds.	There are ___ red counters. There are ___ blue counters. Altogether there are ___ counters. ___ + ___ = ___ ___ + ___ = ___ 9 + 1 = 10 8 + 2 = 10 7 + 3 = 10 6 + 4 = 10	Tommy needs to colour in **all** of the boxes using two different colours. One box of each colour has been done for him.  How many different ways can he colour the boxes?

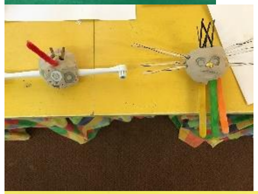
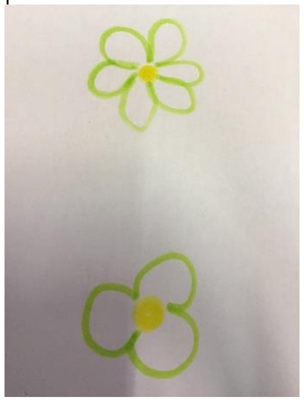
Compare number bonds	Use concrete objects to compare why a number is bigger than another one.	Use cubes to help you fill in <, > or = to make the statements correct.  5 + 5 ◯ 10 5 + 5 ◯ 8 2 + 5 ◯ 5 + 3	$5 + 3 = 4 + \_\_$ $7 + 3 > \_\_ + 2$	Match the number bonds that are equal. Can you use ten frames and counters to prove they are equal? 4 + 5 7 + 1 2 + 6 6 + 3 4 + 2 3 + 3  Amir and Whitney have both created their own number bonds.  My total is greater because I have a 5 and a 3  My total is greater because I have 9 altogether. Who do you agree with? Explain your answer.
Adding together	Using concrete objects to support addition.	There are 5 red cars and 4 blue cars. How many cars are there altogether?  □ + □ = □ □ = □ + □	There are 3 aeroplanes at the airport. 5 more aeroplanes land. How many aeroplanes are there now? Now there are __ aeroplanes altogether.	There are 8 cubes. Some are red and some are yellow. How many different ways can you make a total of 8?  You should show your working out on a ten frame and a part-whole model.
Adding by counting on	First Then Now 	Eva has 13 prize tokens. She wins 5 more. How many prize tokens does Eva have now? 	Mo starts at 9 and counts on 6 9 + 6 = □ Show his calculation on the number line. 	Mo and Jack are working out 11 + 7 Mo says,  11, 12, 13, 14, 15, 16, 17 Jack says,  12, 13, 14, 15, 16, 17, 18 Use a number line to show who is correct.

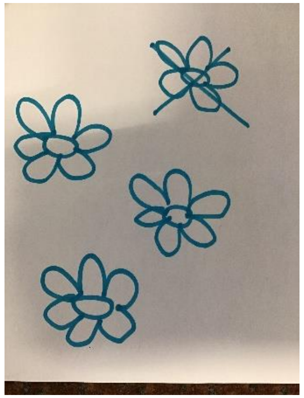
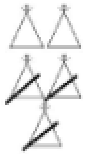
Adding by making 10	Children to use tens frames and counters to partition numbers to make 10 and then add on left over amount.	Rosie has used the 10 frames to calculate 6 + 7  Use Rosie's method to complete:  	 Use Mo's method to calculate: 5 + 8 = ☐ 9 + 4 = ☐ 6 + 8 = ☐	Dexter uses ten frames to calculate eight plus six.  He says,  Do you agree? Explain why.

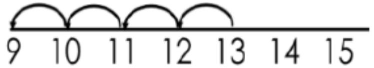
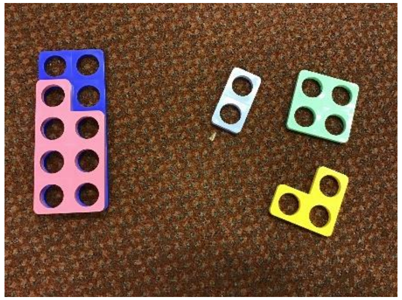
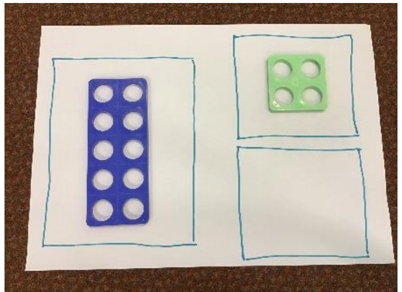
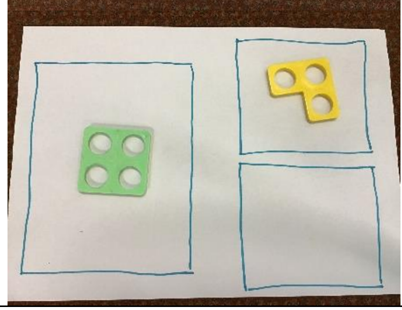
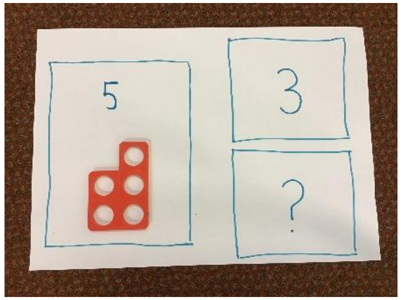
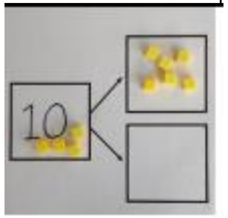
Subtraction				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Finding a part (part whole model)	Use a selection of objects and place them into a part whole model.  	 	Use numbers in a part whole model.  	 Max has 12 balloons. 5 of the balloons burst. How many are left?
Subtraction symbol	Writing and seeing it (magnetic sign) around the different areas of the classroom.		4-2=2 10-6=4	There are 16 biscuits on a plate. Mo eats 5 of them. Complete the sentences. First there were __ biscuits. Then __ were eaten. Now there are __ biscuits. 16 – 5 = __ 
Finding a part, breaking apart	Use unifix e.g. 16-7 take away, use the cubes to split the 7 into 3 and 4.	How many ice creams do not have flakes?  6 – 2 = __  There are __ ice creams that do not have flakes.	 	Teddy works out 15 – 6 This is Teddy's working out:  15 – 5 = 10 – 1 = 9 Why is Teddy's working out wrong?

Counting back	Use number tiles and physically jump back along.	 7 – 3 = ___	Use this method to calculate: 20 – 8 18 – 6 19 – 4	How many ways can you complete this number sentence? Use the number line to help you.  $\square - \square = 11$
Finding the difference	Place 13 cubes in a line and next to it place 5 cubes. Count how many more or less there are.	13-5 =  	First there were ___ sweets. Then ___ sweets were eaten. Now there are ___ sweets.	Max has 12 blue balloons and 5 red balloons. How many more blue balloons than red balloons does he have?
Subtraction – not crossing 10	Count out 20 objects and take away a 1 digit amount, e.g. 20 cubes take away 7 cubes.	 20 – 7 = ___ 	20 – 9 = 11 19 – 8 = 11 18 – 7 = 11 17 – 6 = 11 16 – 5 = 11 etc.	 I have 13 jam tarts, I eat 2 tarts how many will I have left?
Subtraction Crossing 10	Count out a 2 digit amount of objects and subtract a 1 digit number that will cross the tens barrier.	17-9 =  12 – 5 =  	17-9= 12-5= 16-8= 21-4= 17-9= 17-7-2	True or False? 21-7 is greater than 19-5 Can you discuss?

Subtraction				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Subitising	Children use a number grid or a piece of Numicon but leave one space empty. They begin to recognise that it "isn't 4 because it's got one less" repeat for different amounts. Children use two pieces of Numicon and lay them on top of one another and realise that "it isn't 5 because it's got one less" 	Children use pictorial representations, knowing that "it isn't 10 because it has 2 less" 		"I know I haven't got 4 because it is one less" "How do you know it's not..." "I know I haven't got 10 because 5 and 5 is 10 and I've got 5 and 4"
Conservation of number		Children use their finger to know how many they have counted back.	Children hold in their head their starting number and hold in their head how many they are counting back.	Children can see there are 4 teddies but then one is covered over and children tell you how many teddies there are still

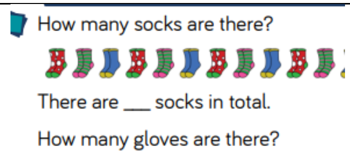
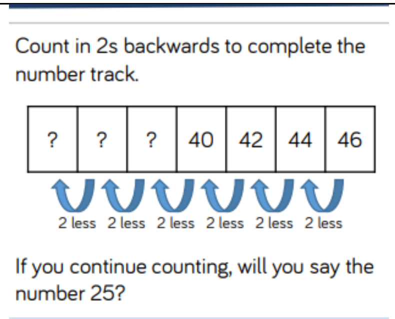
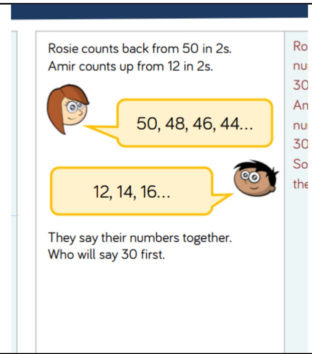
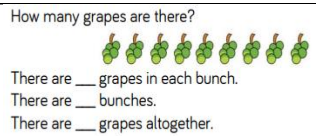
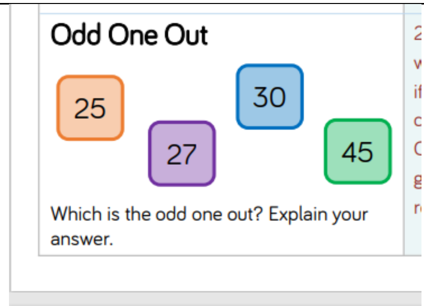
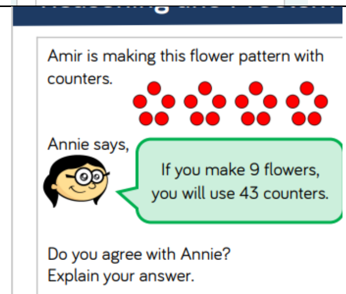
Compare quantities (less/Few)	Children compare different amounts in a variety of different play situations e.g. "I have less bricks than you", "have you got the same as me?"   	Children draw representations e.g. can you put lots of petals on your flower and can you put less on the other flower. 		How do you know there are less? Can you make yours less than mine?

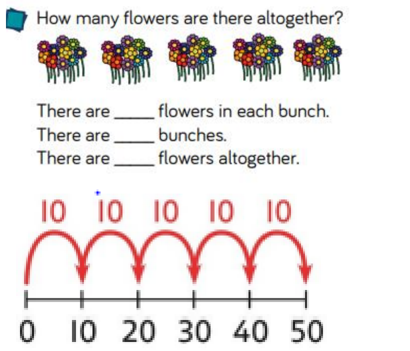
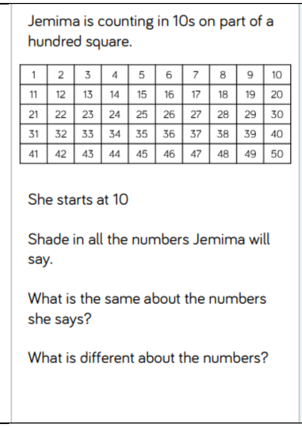
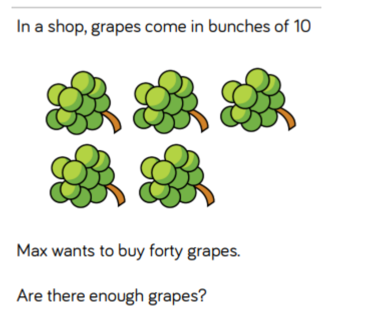
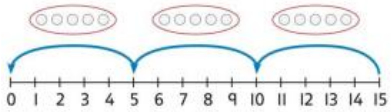
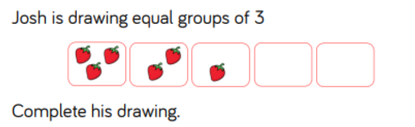
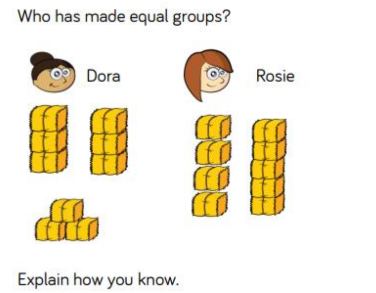
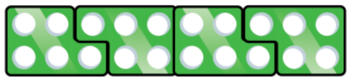
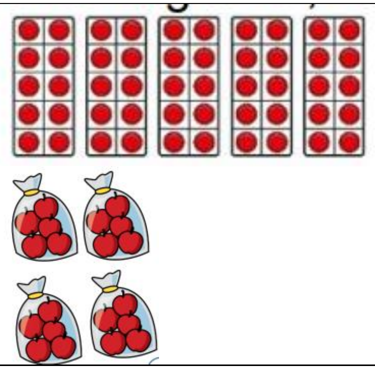
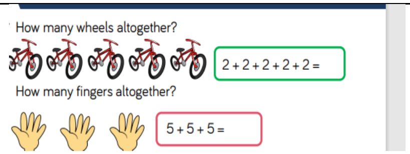
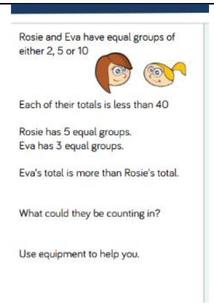
Find/say 1 less	Children use objects and physically remove one object from their group. 	Have pictures of objects and children cross off one object to find one less. 	Children look at the numerals on a number line and know that "11 is one less than 12" 	What would my starting number be if I've now got 7 and I've already taken one away? How do you know that 11 is one less than 12?
Taking away ones from a larger group and counting how many are left	Children have a set of objects and physically remove one.  	Children cross off the amount of objects being taken away and then count how many are left.  	Children read a sum and know what that sum means. 18 -3= 15 	This packet of biscuits had 10 in it now there are 6, how many have gone?

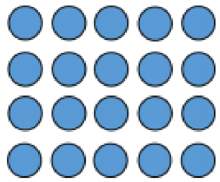
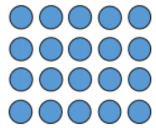
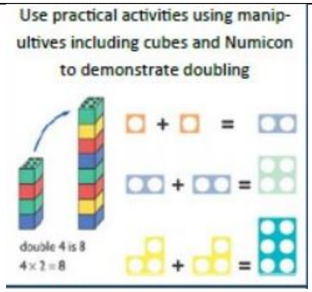
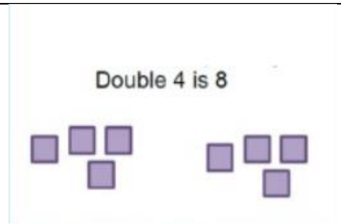
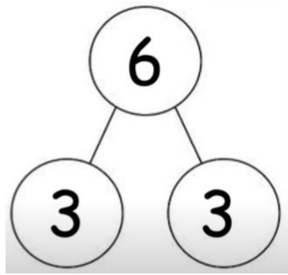
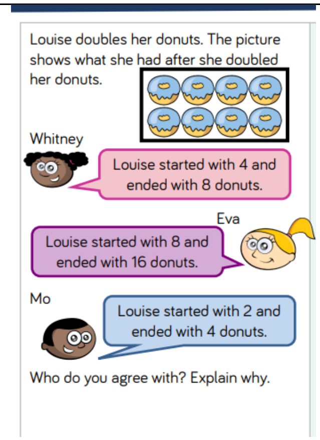
Counting back	Children use counters and count back as they move objects away from the group. 	Children pick a start number, place finger on starting number and move it backwards for each number that they say as they count back. 	Children pick a start number and draw one jump for each number they say as they count back. 	If you start with 15 and end up with 5, how many jumps backwards would you make? You are going to count backwards 5 jumps. Think of 3 starting numbers and the 3 numbers you would land on.
Part part whole	Children find which piece of Numicon fit into the space when layed on top of another piece. Children experiment with different pieces of Numicon 	Children use Numicon. They see the 'whole', they are given one of the parts and then they find the missing part.  	Children are given the 'whole' visually and with the numeral. Children are then given a 'part' as a numeral and they find the missing 'part' as a numeral. 	If 10 is the whole and 6 is one of the parts what would the other part be? 

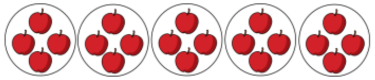
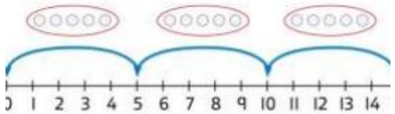
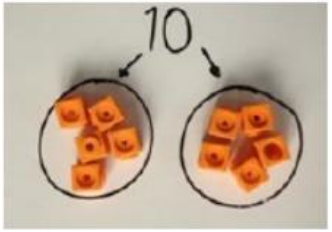
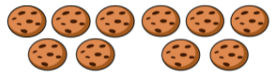
Year 1 statutory requirements relating to multiplication and division:

- solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Multiplication				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Count in 2s	Sorting cubes, objects into pairs, lining up in pairs of twos – count along the pairs.			
Count in 5s	Sorting cubes, objects, fingers on hand into groups of 5 – count along the groups of 5s.			

Count in 10s	Sorting cubes, objects, fingers on hand into groups of 10 – count along the groups of 10s.			
Make equal groups	Sharing objects into two groups and then counting both groups to see if they are equal. 'One for you, one for me' Then, moving to three groups and repeat the process. ' Can ten be shared into three equal groups?'	 Make links between groups of and jumps along a number line.	 *There are 10 children altogether.* *There are 2 in each group.* *There are 5 groups.*	
Add equal groups	Combine groups of equal objects and count to total, using counting patterns. 			

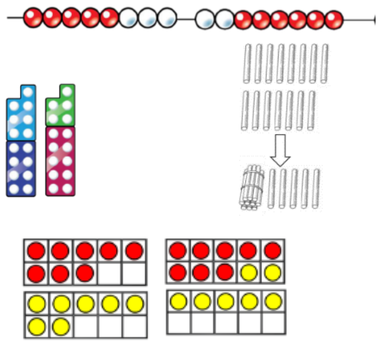
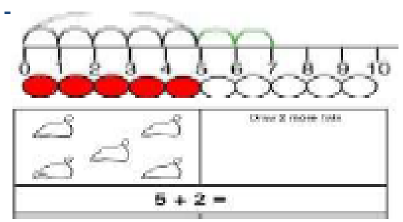
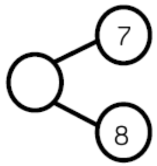
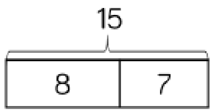
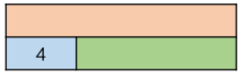
Make arrays	Organise counters, cubes into rows and columns to represent arrays		Match multiplication calculations to arrays - which contain the x sign.  $5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$	One bag holds 5 apples. How many apples do 4 bags hold? Solve true or false statements. Captain Convince challenges.
Make doubles			3 + 3 = 6 	

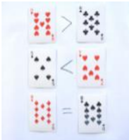
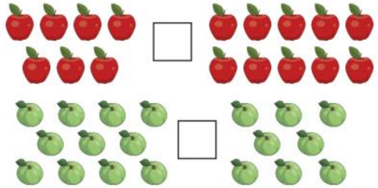
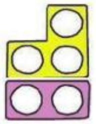
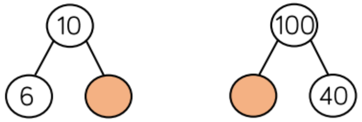
Division				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Make equal groups – grouping (by the number 2, 5, 10)	Learn to make equal groups from a whole and find how many equal groups of a certain size can be made. Sort a whole set people and objects into equal groups.  Group objects into groups of 2s, 5s, 10s.		**Grouping** Children may relate this to counting back in steps of 2, 5 or 10. 	I am thinking of a number between 20 and 30 I can only make equal groups of 5 What must my number be? What happens when I try to make groups of 2 with it? What happens when I try to make groups of 10 with it?
Make equal groups – sharing (into a number of different groups)	Share objects amongst a range of different numbers. 'Share the cubes between the four children.'		10 = 2+2+2+2+2 10= 5+5	Dora has 10 biscuits.  She wants to share them equally at her party. How many people could be at the party?

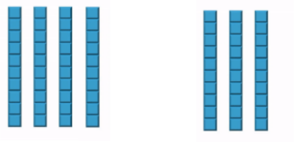
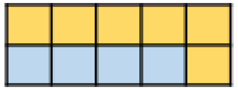
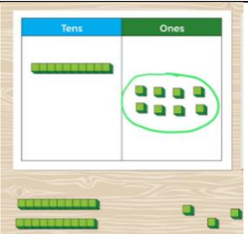
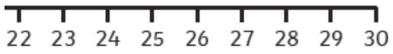
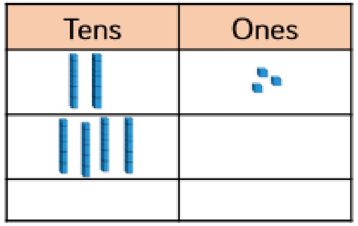
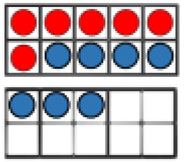
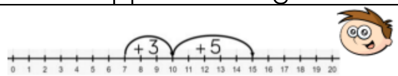
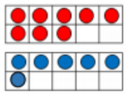
Yr 2:

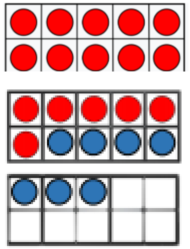
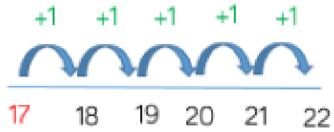
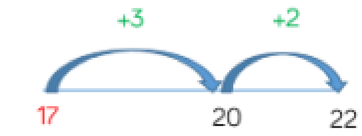
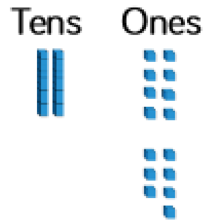
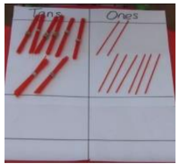
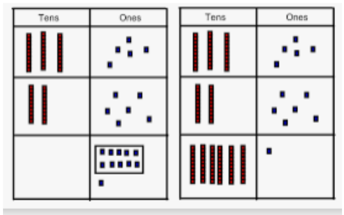
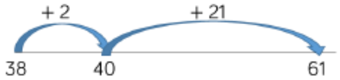
Year 2 statutory requirements relating to addition and subtraction:

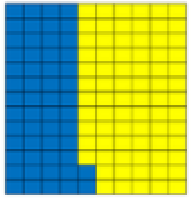
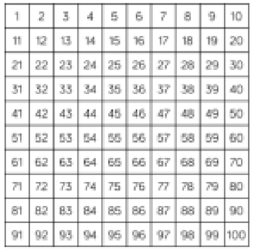
- solve problems with addition and subtraction:
  - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
  - applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
  - a two-digit number and 1s
  - a two-digit number and 10s
  - 2 two-digit numbers
  - adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

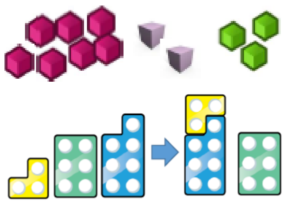
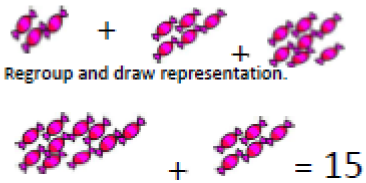
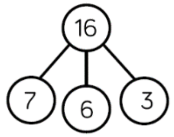
Addition				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Fact families – addition bonds to 20			 $8 + 7 = 15$ 	Missing number questions e.g. Here is an incomplete bar model. The total is greater than 10 but less than 20 What could the missing numbers be? How many different combinations can you find? 

	Can you count on from --- to find the total? What numbers make 10? How can you use this to make 20?			
Compare number sentences	 "Can you make a number that is greater than 6?" "Can you make a number that is less than 2+3?"	 Use the > < = signs to make these statements correct.	7+7 $\square$ 14 21+5 $\square$ 25 50+8 $\square$ 57	Both missing numbers are less than 10 $7 + \square < 7 + \square$ How many different possible answers can you find?
Related facts	 Children make 10 using the 9 and 1. "If I swap the 1 and 9 around, will the answer stay the same?" (Knowing 9+1 is the same as 1+9) "If I take away 1, what will I be left with?" (Knowing that if you know 9+1=10, then you also know 10-1=9)	 3 + 2 = 5 5 - 3 = 2 5 - 2 = 3 "What other facts do you know using these numbers?"	 	Alex says,  If I know 9 + 1 = 10, I can work out 90 + ___ = 100 Find the missing number and explain how Alex knows.

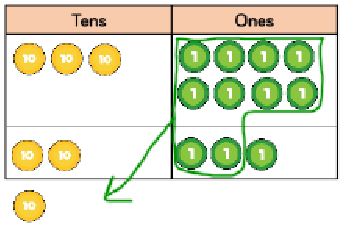
Bonds to 100 (tens)	 40 + 30 = 70 "What other ways could we make 70?"	 What bond to 100 does this show?	2 + 6 = 8 2__ + __0 = 80	Eva thinks there are 10 different number bonds to 90 using multiples of 10 Amir thinks there are only 5 Who is correct?
Add 1's	 	**22 + 7**  Using a number line. Draw on the jumps.	Continue the number track. 31 | | | 34 | |	54 46 61 5 3 9 Add a number from a circle to a number from a square. 54 + 5 How many different totals can you make?
Adding tens	23 +40 =  	Tens and ones chart  Children can start to draw their own tens and ones chart to support workings out.	2 3 + 4 0 ____ | | | | 35 | 45 | 55 | | | |	Mo says,  I know that 10 more than 72 is 82 because I only have to look at the tens digit. Is he correct? Explain your reasoning.
Add by making 10	 Using tens frames to find the answer to 6 + 7	 Working out 7+8 by using number bonds to 10 (counting to the nearest 10, then adding the remainder)	8 + 6 = Children use known facts to calculate: 8 + 2 = 10 Then… 10 + 4 = 14 8 + 6 2 4	Dexter uses ten frames to calculate eight plus six.  He says,  8 + 6 = 16 Explain how Dexter should have worked this out.

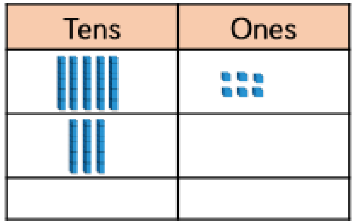
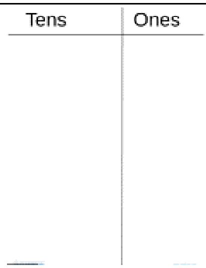
Add a 2-digit and 1 digit by crossing 10	Use tens frames, diennes and numicon to represent the 2-digit numbers.  Showing 16 + 7 = 23	$17 + 5 =$  Moving on to:  	 $\begin{array}{r} 2\ 8 \\ +\ \ 7 \\ \hline 3\ 5 \\ \hline 1 \end{array}$	Here are three digit cards.  Place the digit cards in the number sentence. How many different totals can you find? $\square\square + \square =$ What is the smallest total? What is the largest total?
Add two 2-digit numbers – not crossing ten – add ones and add tens	 	 46 + 11 Jump tens, then ones	$\begin{array}{r} 5\ 2 \\ +\ 4\ 1 \\ \hline 9\ 3 \\ \hline \end{array}$	What digits could go in the boxes? $\square 2 + \square 5 = 87$
Add two 2-digit numbers – crossing ten – add ones and add tens	 	 Jump to the nearest 10, then count on the remainder.	$\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline 1 \end{array}$	Find all the possible pairs of numbers that can complete the addition. $\begin{array}{r} \boxed{1}\boxed{} \\ +\ \boxed{2}\boxed{} \\ \hline \boxed{4}\boxed{2} \\ 1 \end{array}$ How do you know you have found all the pairs? What is the same about all the pairs of numbers?

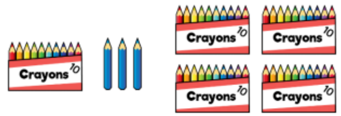
<table>
<tr>
<td>Bonds to 100 (tens and ones)</td>
<td>
Using dienes or similar-
Show that 42 + 58 = 100</td>
<td>

Use a hundred square.
“If 40 squares are shaded, how many are not?”
“If 45 squares are shaded, ho many are not?”</td>
<td>$25 + \_\_\_ = 100$
$\_\_\_ + 69 = 100$
$100 - 84 = \_\_\_$
$100 - \_\_\_ = 11$</td>
<td>Each row and column adds up to 100.
Complete the grid.
<table><tr><td>45</td><td>45</td><td></td></tr><tr><td></td><td>35</td><td></td></tr><tr><td>15</td><td></td><td>65</td></tr></table></td>
</tr>
<tr>
<td>Add three 1-digit numbers</td>
<td>
Which number will we start counting from?
What patterns can you see to help you? (e.g. bonds, doubles)</td>
<td>
</td>
<td>$\boxed{7 + 6 + 3 = 16}$


$\underbrace{7 + 3}_{10} + 6 = 16$
$7 + 6 + 3 = 16$
10</td>
<td>Take 3 consecutive one-digit numbers, e.g. 4, 5 and 6.
Add them together.
What do you notice?</td>
</tr>
</table>

<table>
<tr><th colspan="5">Subtraction</th></tr>
<tr><th>CONCEPT
(small steps)</th><th>CONCRETE
(The ‘doing’ stage)</th><th>PICTORIAL
(The ‘seeing’ stage)</th><th>ABSTRACT
(the ‘abstract’ stage. Symbols and numbers are used)</th><th>REASONING/ MASTERY</th></tr>
<tr><td>Subtract 1’s
(one less)</td><td>
</td><td>
Using a number line. Draw on the jumps.</td><td><table>
<tr><td>12</td><td>13</td><td></td><td>15</td><td></td><td>17</td><td></td><td></td></tr>
<tr><td>11</td><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>12</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td></tr>
</table>Continue the number track</td><td>Continue the pattern

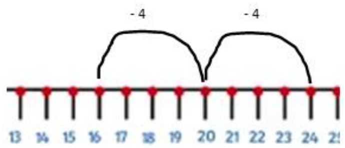
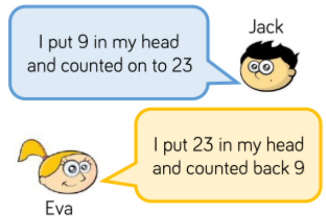
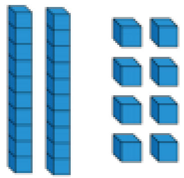
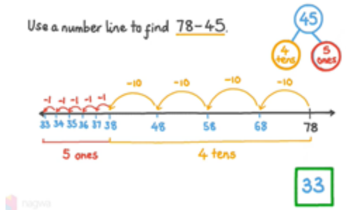
$22 = 29 - 7$
$22 = 28 - 6$</td></tr>
<tr><td>Subtract 10’s
(ten less)</td><td>56 – 30 =
(using diennes)

</td><td>

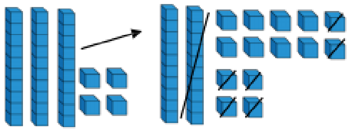
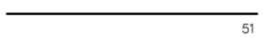
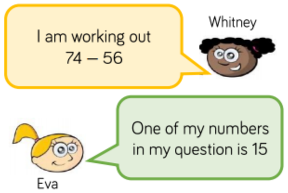
10s frame. Children can start to draw their own tens and ones chart to support workings out.</td><td>$\begin{array}{r} 5\ 6 \\ -3\ 0 \\ \hline \\ \hline \end{array}$</td><td>

Class 3 gives one of their full packets of crayons away.

How many crayons do they have left?

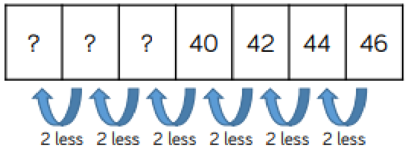
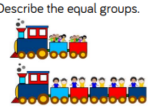
Explain your reasoning.</td></tr>
</table>

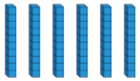
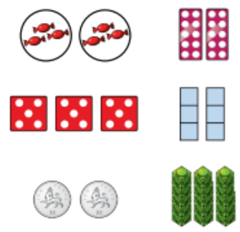
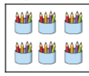
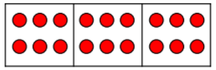
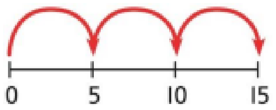
Subtract one-digit from 2 digit	24 – 8 = (using diennes) 	24 – 8:  Moving on to: 	$\begin{array}{r} {}^{1}\cancel{2}\;{}^{1}4 \\ -\quad 8 \\ \hline 1\;6 \end{array}$	Jack and Eva are solving the subtraction 23 – 9 Here are their methods:  Who's method is the most efficient? Can you explain why? Can you think of another method to solve the subtraction.
Subtract with two-digits – no exchanging	Subtract 13 from 28 		$\begin{array}{r} 2\;8 \\ -\;1\;3 \\ \hline 1\;5 \end{array}$ 34 – 13 = ____ 34 30 4 −10 −3 20 1	Find the missing numbers. $\begin{array}{r} \boxed{6}\boxed{} \\ -\;\boxed{2}\boxed{} \\ \hline \boxed{4}\boxed{2} \end{array}$ Is this the only possible solution? Explain your answer. Make the numbers using Base 10 to help you find your answer.

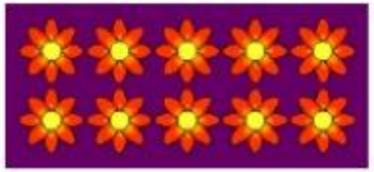
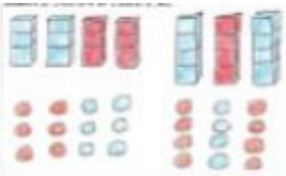
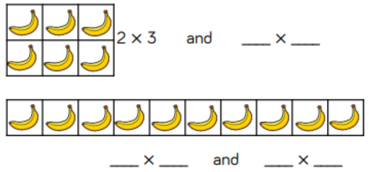
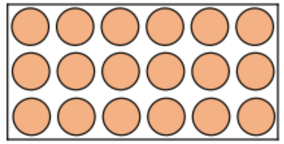
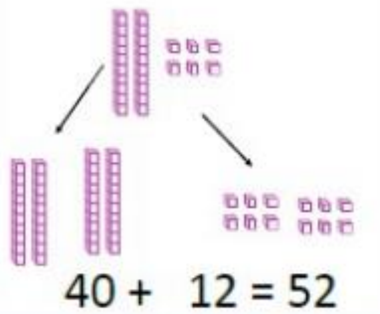
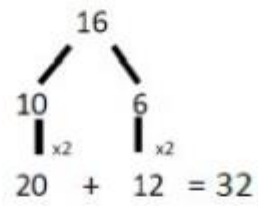
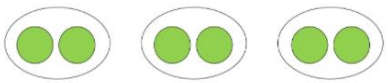
Subtract with two-digits – exchanging	Take 16 away from 34 	Use the number line to subtract 12 from 51  Can you subtract the ones first and then the tens? Can you partition the ones to count back to the next ten and then subtract the tens?	$\begin{array}{r} {}^{2}\cancel{3}\,{}^{1}4 \\ -\ 1\ 6 \\ \hline 1\ 8 \\ \hline \end{array}$	Eva and Whitney are working out some subtractions.  Whitney's answer is double Eva's answer. What could Eva's subtraction be?

Year 2 statutory requirements relating to Multiplication and Division:

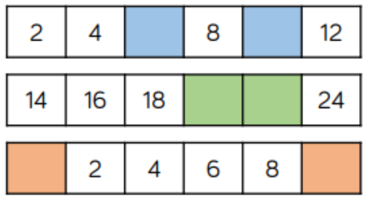
- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Multiplication				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Recognise equal groups	Sharing objects between groups and checking they are the same	Complete the stem sentences.  There are ___ equal groups with ___ in each group.	 	Talk Partners: Captain Convince questions True/False Odd one out Describe the equal groups.  What is the same and what is different in each group?

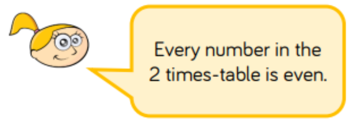
Make equal groups	Using different resources such as counters, numicion, diennes, make differnet groups	The Base 10 shows six equal groups with ten in each group. There are six tens.  How else can you represent these as equal groups?	Match the equal groups.  Three 5s Two 10s Two 3s	Comparing images or statements with reasons
Add equal groups	Objects in sets of 2's, 3's 5' and 10's in groups to add together	Complete:  There are ___ equal groups with ___ in each group. There are ___ 3s. ___ + ___ = 6	$5 + 5 = 2 + 2 + 2 + 2 + 2$ True or false	Complete the table.  Draw It | Say It | Add It
Multiplication sentences using the x symbol	Sentences to read using x symbols linked to repeated addition. Objects to sort into lots	Complete the sentences to describe the equal groups.  ___ + ___ + ___ = 18 ___ × ___ = 18 There are ___ equal groups with ___ in each group. There are three ___. Multiplication grids, numicon, printed number lines	Use a number line and write as repeated addition and as multiplication.  *5 + 5 + 5 = 15* *3 × 5 = 15*	Fill in the missing parts to complete a story: Complete: Addition | Multiplication | Story 10 + 10 + 10 | | | 6 × 5 | | | Odd one out/true or false/
Multiplication sentences from pictures	Using 2 equal groups, match to x calculation	Drawing to match a x calculation.	Complete:  ___ × ___ = ___ ___ lots of 3 = ___ ___ multiplied by ___ = 12	 2 × 5 5 + 5 5 × 2 Each calculation could explain the image. Explain why.

<table>
<tr>
<td>Use arrays</td>
<td>Egg boxes, Numicon, .Use objects laid out in trays to find answers to 2 lots of 5, 3 lots of 2 etc
</td>
<td>Drawing arrays to match a x calculation

Understand that array can be rotated</td>
<td>
</td>
<td>Find different ways to solve six lots of three.

Find multiple ways to solve a problem and know that you've found all the ways.</td>
</tr>
<tr>
<td>Make doubles</td>
<td>Model doubling using tens and ones.

</td>
<td>Draw pictures and representations to show how to double numbers.
Mr Double Trouble song to remember recall.</td>
<td>Partition a number and then double each part before recombining it back together.

</td>
<td>True or false, odd one out, Captain Convince problems
</td>
</tr>
<tr>
<td>2 times-table</td>
<td>Sorting cubes, counters and other objects into groups of 2s. Count up in those groups.

'3 groups of 2 … 2, 4, 6'

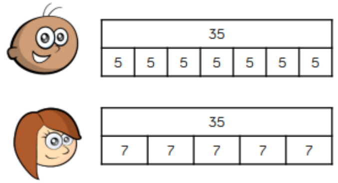
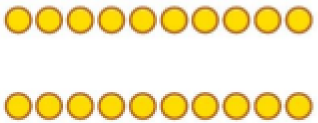
Percy Parker songs.</td>
<td>Count in 2s to calculate how many eyes there are.

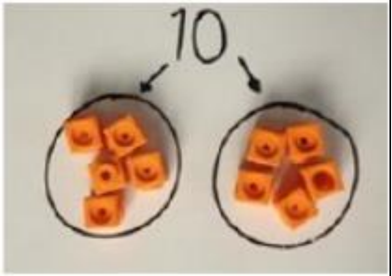
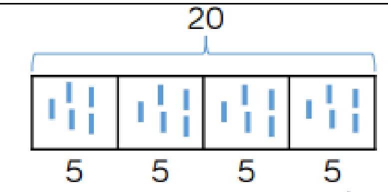
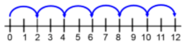
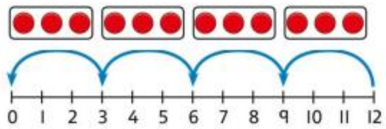
There are ___ eyes in total.
Use of number lines, multiplication grid, hundred squares.</td>
<td>Complete the number track.


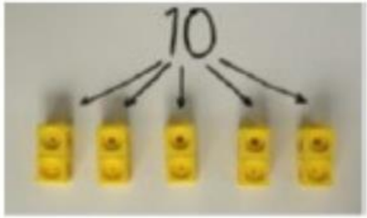
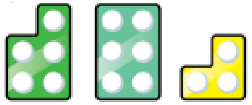
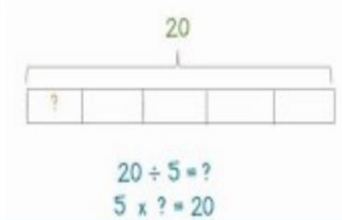
Count in multiples aloud.

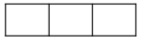
Answer written multiplication questions.
'4X2=?'</td>
<td>Eva says,


Captain Convince
True or False
Odd one out</td>
</tr>
</table>

5 times-table	Sorting cubes, counters and other objects into groups of 5s. Count up in those groups.  '4 groups of 5… 5, 10, 15, 20' Percy Parker songs.	How many petals altogether?  Use of number lines, multiplication grid, hundred squares.	There are 35 fingers. How many hands? ___ × 5 = 35 Count in multiples aloud. Answer written multiplication questions. '8X5 =?'	Tommy and Rosie have both drawn bar models to show 7 × 5  What's the same and what is different about their bar models? Captain Convince True or False Odd one out
10 times-table	Sorting cubes, counters and other objects into groups of 10s. Count up in those groups.  '2 groups of 10... 10, 20' Percy Parker songs.	How many crayons are there altogether?  There are ___ crayons altogether. Use of number lines, multiplication grid, hundred squares, tens frames.	Draw arrays to match repeated additions and vice versa. Circle counters/crosses in arrays to show the number sentence given. Count in multiples aloud. Answer written multiplication questions. '5X10 =?'	On sports day, Jack runs 10 metres, 7 times.  Which of these calculations do **not** describe this word problem? 10 + 7 7 × 10 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 10 + 10 + 10 + 10 + 10 + 10 + 10 Captain Convince True or False Odd one out

Division				
CONCEPT (small steps)	**CONCRETE (The 'doing' stage)**	**PICTORIAL (The 'seeing' stage)**	**ABSTRACT (the 'abstract' stage. Symbols and numbers are used)**	**REASONING/ MASTERY**
Make equal groups - sharing	Divide by sharing objects into equal groups one at a time.  ___ has been shared equally into ___ equal groups. I have ___ in each group. ___ groups of ___ make ___	 Represent the objects shared into equal parts using a bar model/groups.	24 children are put into 4 equal teams. How many children are in each team? 24 = 4+4+4+4+4+4 24 = 6x4 24 ÷ 4 = 6	Alex has 20 sweets and shares them between 5 friends.  Tommy has 20 sweets and shares them between 10 friends. Whose friends will receive the most sweets? How do you know? Prove with concrete resources.
Make equal groups - grouping	Divide by making equal groups. Count to then find the total number of groups. Pencils come in packs of 20 We need to put 5 in each pot. How many pots will we need?  There are ___ pencils altogether. There are ___ pencils in each pot. There are ___ pots. '4 groups of 5 make 20.'	Mo uses a number line to work out how many equal groups of 2 he can make from 12  Use a number line to work out how many equal groups of 5 you can make from 30 Use of number lines to count in equal groups.	Understand how to relate division by grouping to repeated subtraction.  There are 4 groups now. *12 divided into groups of 3.* *12 ÷ 3 = 4* *There are 4 groups.* 12-3= 9, 9-3=6, 6-3=3, 3-3=0 12 ÷ 3 = 4	You have 30 counters.  How many different ways can you put them into equal groups? Write down all the possible ways. Find different ways to group the same number.

Divide by 2	Share an equal even number of counters or objects into groups of 2.		5 groups of 2 = 10 10 ÷ 2 = 5 5 x 2 = 10 10 = 2 x 5 10= 2+2=2+2=2	True or false: Does this number divide by 2? How do you know?
Odd and even numbers	Use counters, cubes or other resources to make numbers and share them into two equal groups. Groups will be equal if even, not equal if odd.  Numicon - Find or draw other odd and even pieces. What do you notice?	 Use visual representations of the numbers and sort into odd and even	Spot the mistakes: odd: nine, 1, 6, 3 even: 10, eight, 25	Tommy says that when he adds two odd numbers together, his total will be even. Is he correct? Convince me. 
Divide by 5	Starting with a counting in 5s numbers – share into groups of 5, then count how many equal groups are made.		4 groups of 5 = 20 20 ÷ 5 = 4 5 x 4 = 20 20 = 4 x 5 20 = 5+5+5+5	A party bag contains 5 sweets. A jar contains 5 party bags.  Ron has 75 sweets. How many party bags will he need? How many jars will he need?

Divide by 10	Grouping and sharing objects by 10	Apples can be sold in packs of 10 How many packs can be made below? 	When 30 apples are sold in packs of 10, ___ packs of apples can be made. Can you show this in a bar model?  Label and explain what each part represents. 3 groups of 10 = 30 30 ÷ 10 = 3 10 x 3 = 30 30 = 3 x 10 30 = 10 + 10 + 10	Cakes are sold in boxes of 10 Jack and Alex are trying to pack these cakes into boxes.  Jack says,  Alex says,  Who is correct? Explain how you know. Mrs Owen has some sweets. She shares them equally between 10 tables. How many sweets could each table have? Find as many ways as you can. What do you notice about your answers? **True or false?** Dividing by 10 is the same as dividing by 5 then dividing by 2

Monitoring and review

This policy is reviewed every two years by the headteacher and the Maths lead. All members of staff teaching and supporting children are required to familiarise themselves with content of this policy.

Any changes made to this policy will be communicated to all relevant stakeholders.

The next scheduled review date for this policy is **November 2023.**