Calculations Policy

Introduction

This calculations policy sets out the methods used to help our pupils with calculations and has been devised to meet the requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It uses the principles and pedagogy of Big Maths and Little Big Maths followed in our school and is designed to give pupils a consistent and smooth progression of learning in calculations across the school.

As an infant and nursery school, we believe that an early understanding of the concept and language of ***amounts***, and of number and the number system, lay the foundations for more formal aspects of calculations. Further, we believe this understanding must be combined with secure knowledge of basic number facts and increasingly mature fluency and reasoning using these number facts. Children are taught from EYFS using concrete methods that numbers can be made in different ways and to reason about what is possible and what is not. They are taught to memorise number facts and have a quick response to those facts. These number facts are called ***Learn its*** and the fluency and reasoning that come from them are called ***It's Nothing New***. Children are taught that their ***Learn its*** will help them solve many calculations and can be applied to any object, amount or unit of measure. They are in addition taught a wide range of other strategies for calculations that will support them in addition to their number fact knowledge.

This policy should be read in conjunction with our Mathematics Scheme of Work available on the website.

NB we do not introduce column methods in this school.

Aims

Through our teaching of number and calculations we aim to:

- Develop in very young children an understanding of ***amounts*** and number;
- Develop children's understanding of calculations from the concrete through pictorial to abstract;
- Move children from counting to calculating;
- Develop children's fluency with basic number facts (Learn Its);
- Develop children's fluency in mental calculation;
- Develop children's fluency in the use of written methods;

- Develop children's understanding of the = symbol;
- Teach children to look for patterns and make connections;
- Develop children's skills in conjecturing and reasoning;
- Help children become confident in choosing and using a strategy that will get them to the correct answer as efficiently as possible;
- Help children to understand mathematical structure and to work systematically;
- Contextualise the mathematics;
- Teach children to use correct mathematical terminology and speak in full sentences.

Scheme of work (SoW)

For a complete termly breakdown of which ***Learn Its*** and calculations are taught at any given time please see our Scheme of Work on the website. This SoW also lists the teaching of ***amounts*** that takes place in nursery.

Nursery

In nursery children are taught about ***amounts*** (see SoW) as well as being introduced to numbers and counting through a wide age-appropriate range of activities, songs and stories. These activities, songs and stories will also introduce them to simple calculations such as 1 more and 1 less (e.g. singing 5 Currant Buns in a baker's shop).

Number and the number system

Children in reception learn what each number looks like in turn and how it can be made in different ways. This will support their subsequent understanding of calculations. For example:

Numeral	Concrete	Pictorial	Abstract
3			Three can be made out of a two and a one ***or*** three ones.

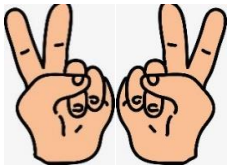
Learn its

Through Little Big Maths (Nursery and Reception) and Big Maths (Years 1 and 2), children are taught quick response to number facts. These are known as ***Learn Its*** and are introduced termly and taught cumulatively. They are also taught to count in multiples of 2, 5, 10, 100, 25 and 3. All of this underpins fluency and the development of strategies for calculation.

Year Group	Term 1	Term 2	Term 3
Nursery	I have 2 hands	I have 1 head	My hand has 5 fingers
Reception	1 + 1; 2 + 2	3 + 3; 4 + 4; 5 + 5	2 + 1; 2 + 3 Multiples of 10
Year 1	Revision of doubles to 10. All number bonds to make 10. Multiples of 5	2 + 4; 2 + 5; 2 + 6; 2 + 7; 2 + 8; 2 + 9; 3 + 4; 3 + 5; 3 + 6	Doubles to 20. Multiples of 2
Year 2	3 + 8; 3 + 9; 4 + 7; 4 + 8; 4 + 9 10 times table	5 + 4; 5 + 6; 6 + 7; 8 + 7; 8 + 9 5 times table	5 + 7; 5 + 8; 5 + 9; 6 + 8; 6 + 9; 7 + 9; 2 times table Multiples of 3

Children in nursery are introduced to the concept of ***Learn its*** as quick response to concrete facts as in the table above.

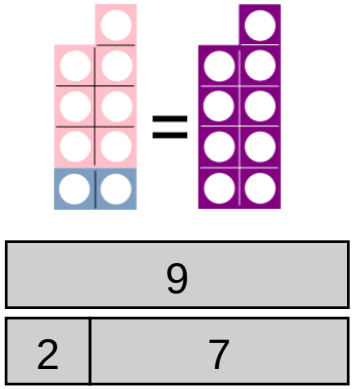
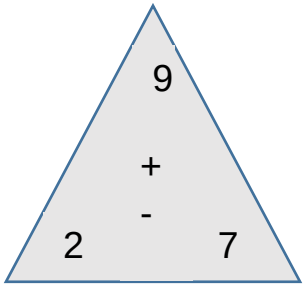
Children in reception are taught their first addition ***Learn its*** using concrete/pictorial/abstract methods:

Concrete	Pictorial - Numicon	Abstract
		2 + 2 = 4

Subsequent ***Learn its*** in Years 1 and 2 will also be taught from concrete through pictorial methods before being learnt as number facts.

Children are taught in Year 1 that subtraction is the inverse of addition through concrete and pictorial methods such as Numicon and bar models.

Children are also taught from Year 1 to create fact families using these number facts and to extend them into multiples of 10 and 100.

		2 + 7 = 9 7 + 2 = 9 9 – 2 = 7 9 – 7 = 2	20 + 70 = 90 70 + 20 = 90 90 – 20 = 70 90 – 70 = 20
Numicon model/ Bar model	Fact family triangle	Fact family	Multiples of 10

They develop fluency and reasoning by understanding that if they know one fact they can deduce others using mathematical patterns:

7 + 2 = 9 ***so*** 17 + 2 = 19 27 + 2 = 29 37 + 2 = 39 etc	2 + 7 = 9 ***so*** 12 + 7 = 19 22 + 7 = 29 32 + 7 = 39 etc	9 – 7 = 2 ***so*** 19 – 7 = 12 29 – 7 = 22 39 – 7 = 37 etc	9 – 2 = 7 ***so*** 19 – 2 = 17 29 – 2 = 27 39 – 2 = 37
Addition	Commutative law	Subtraction	

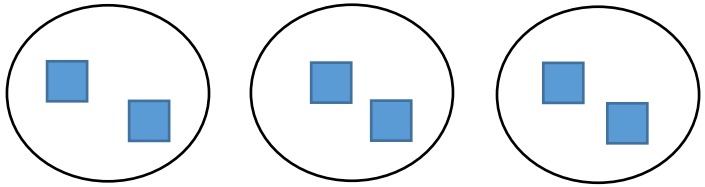
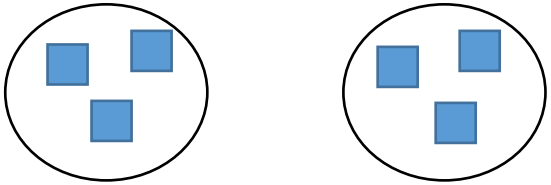
Children are taught to look for ***Learn its*** in larger calculations presented to them:

53 + 6 = I know that 3 + 6 = 9 so I know that 53 + 6 = 59	60 + 30 = I know that 6 + 3 = 9 so I know that 60 + 30 = 90

They learn to use their knowledge of doubles to deduce *near doubles* and calculations involving half:

6 + 7 = I know that 6 + 6 = 12 so I know that 6 + 7 = 13	Half of 90 = I know that 80 + 10 = 90 I know that 40 + 40 = 80 so half of 80 is 40. I know that half of 10 is 5 ***so*** I know that half of 90 = 45

In Reception and Year 1 children are taught multiplication as grouping and division as sharing using concrete and pictorial methods. They are taught to count in 10s, 5s and 2s from memory and to use this to support them in finding totals efficiently. Towards the end of Year 1 they are introduced to the multiplication and division symbols. Through concrete methods they discover that the commutative law holds for multiplication as it does for addition.

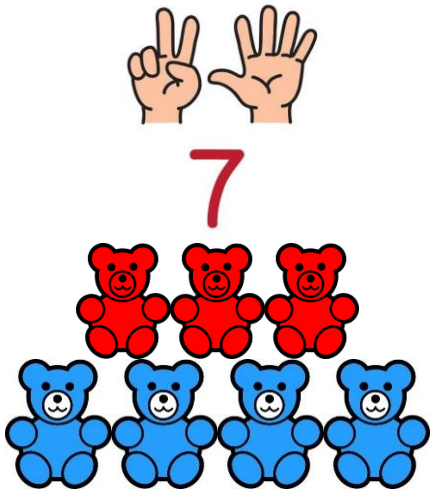
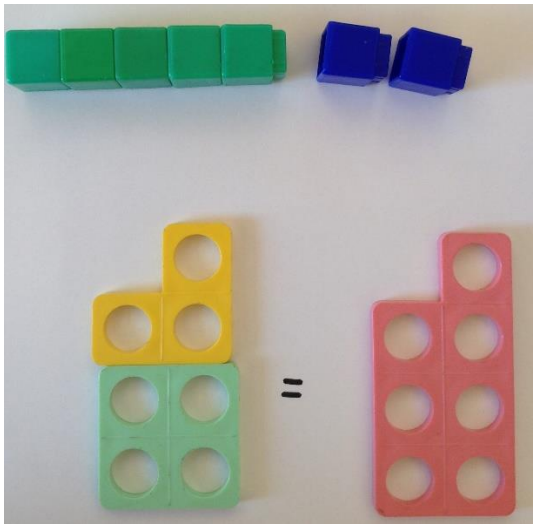
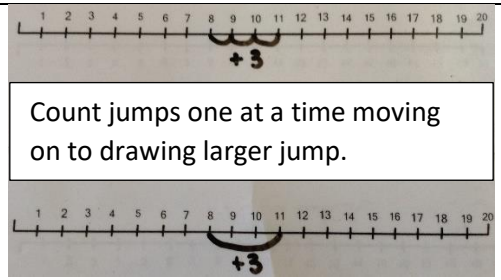
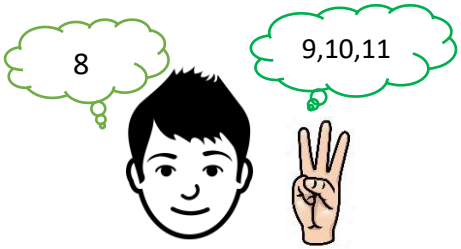
2 x 3 *has the same total as …* 	3 x 2 

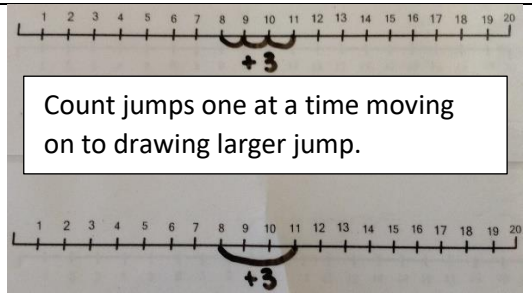
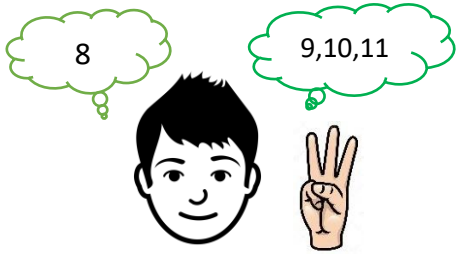
Children in Year 2 continue to be taught strategies for multiplication and division and are expected to learn the 2, 5 and 10 times tables as ***Learn its***.

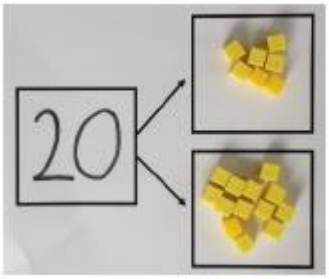
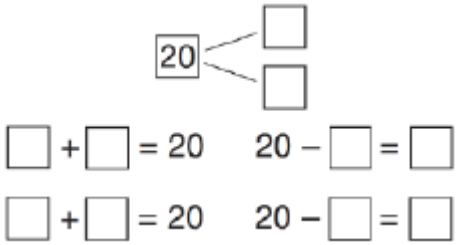
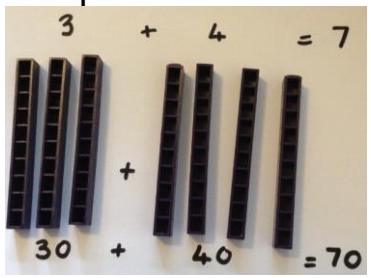
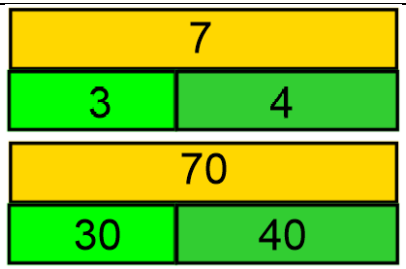
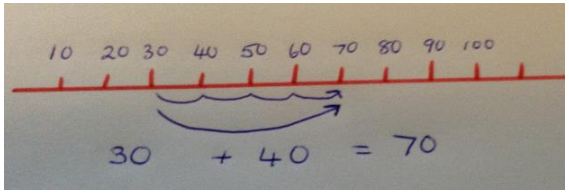
They are taught that division is the inverse of muliplication and they can write fact families for each multiplication:

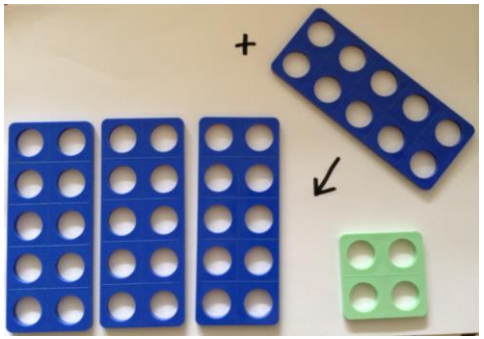
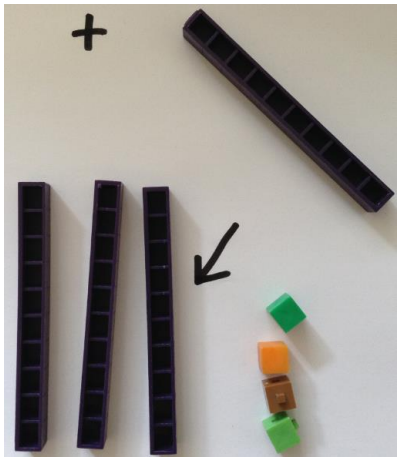
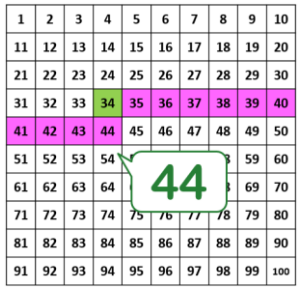
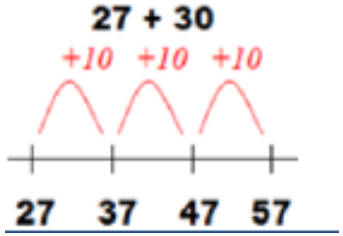
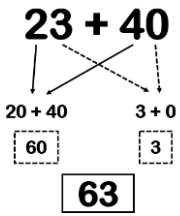
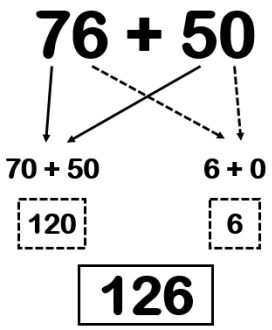
2 x 3 = 6 3 x 2 = 6 6 ÷ 2 = 3 6 ÷ 3 = 2

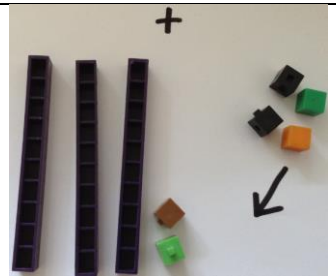
Calculation strategies taught from concrete through pictorial to abstract:

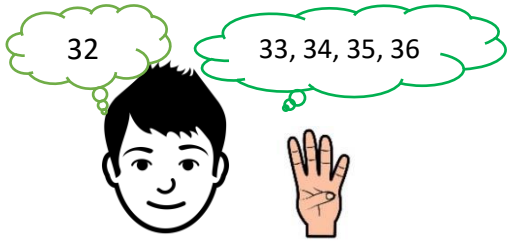
Addition – Reception into Year 1			
Steps	Concrete	Pictorial	Abstract
Add numbers of objects to 10. Read number sentence Count out each group. Count on from first group.			2 + 5 = 7 3 + 4 = 7 Use my learn its
Solve an addition by counting on Start on bigger number. Use a numberline Use mental methods	8 + 3 = 	 	Use my learn its 3 + 8 = Put the bigger number in my head and count on. NB By Year 2 Term 2 children should be able to solve any 1 digit plus 1 digit calculation in their head using counting on or Learn its.

Solve a simple missing number problem Start on first number. Count on how many more are needed using objects, a numberline or mental methods.	8 + ☐ = 11 	 	Use my learn its I know 8 + 3 = 11 8 + ☐ = 11 so the missing number is 3. Put the first number in my head and count on.

Addition – Year 2			
Steps	Concrete	Pictorial	Abstract
Use known number facts	 Children explore ways of making numbers within 20		NB By Year 2 Term 2 children should be able to solve any 1 digit plus 1 digit calculation in their head using counting on or Learn its. 15 + 2 = 17 because 5 + 2 = 7 so I can work out □ + 2 = 17 □ - 2 = 15 15 + □ = 17 17 - □ = 15
Add multiples of 10	30 + 40 = 70 3 tens plus 4 tens = 7 tens  (Introduced in Year 1)	 	Use Learn its to find answers to addition of multiples of 10 (already introduced in Year 1): 3 + 4 = 7 to 30 + 40 = 70 and 300 + 400 = 700

Add 10 to any 2 digit number leading to **Add multiple of 10 to 2 digit number**	34 + 10 = Show using Dienes rods and ones or using Numicon:  	34 + 10 =   and  and  	I know I add 1 to the tens digit 34 + 10 = 44 and I can add other multiples of 10 in the same way: 27 + 30 = 57 23 + 40 = 63 76 + 50 = 126

<table>
<tr>
<td>Solve a simple 2 digit plus 1 digit problem</td>
<td> 

32 + 4 = 36

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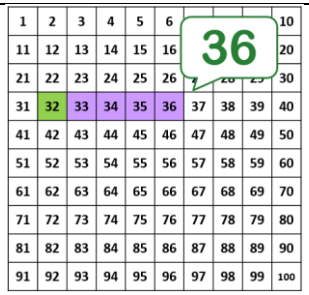
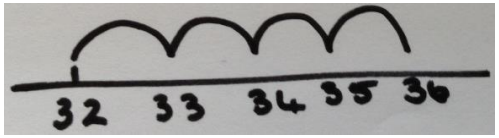
<td> 

32 + 4 = 36

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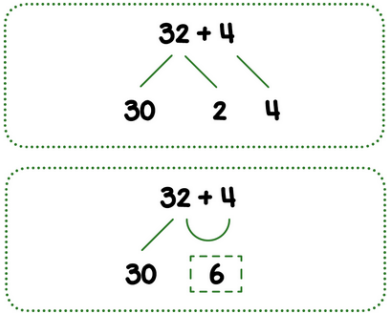
<td> 

32 + 4 = 36</td>
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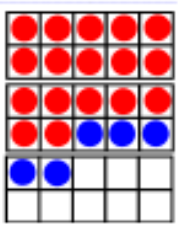
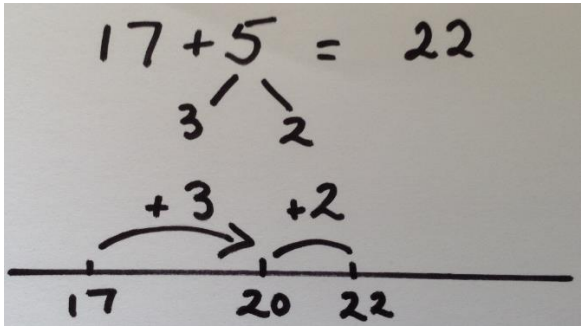
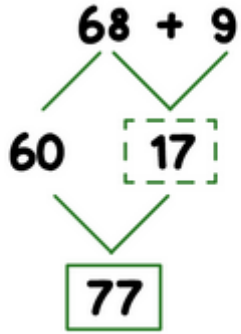
<tr>
<td>Solve any 2 digit plus 1 digit problem.</td>
<td> 
17 + 5 = 22
Use ten frame to make ‘magic ten
Children explore the pattern.
17 + 5 = 22
27 + 5 = 32</td>
<td>17 + 5 = 22

</td>
<td>68 + 9 = 77

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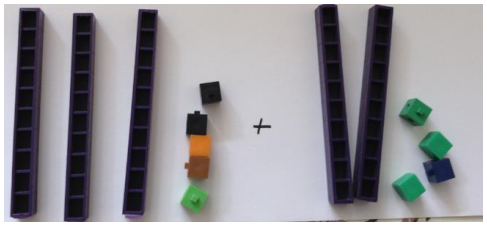
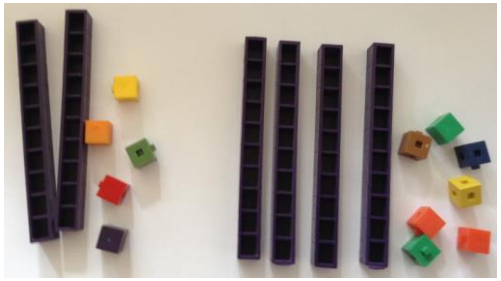
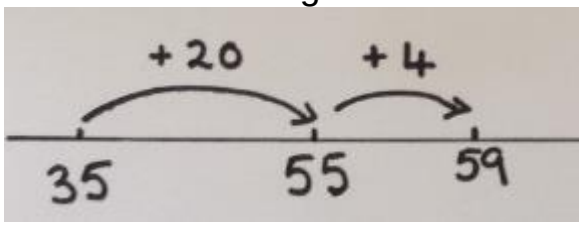
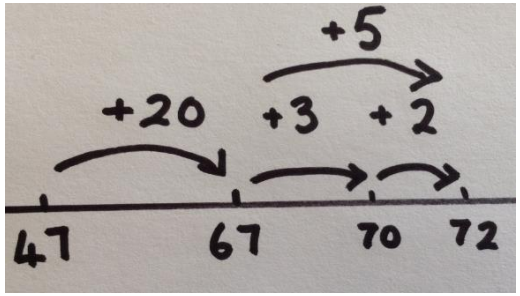
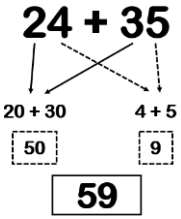
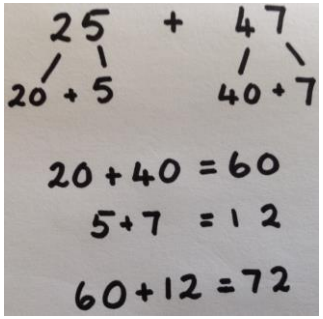
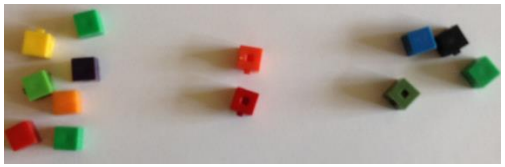
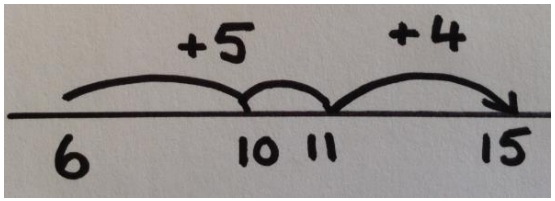
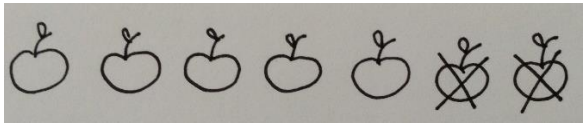
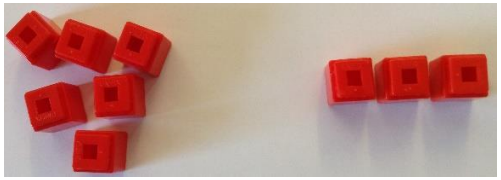
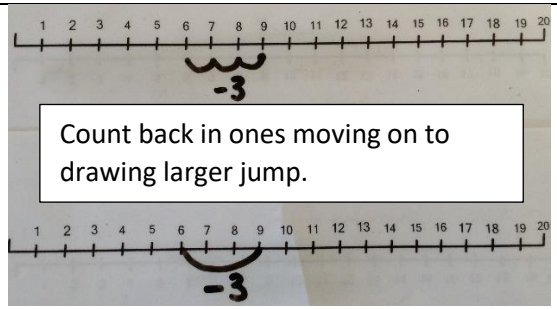
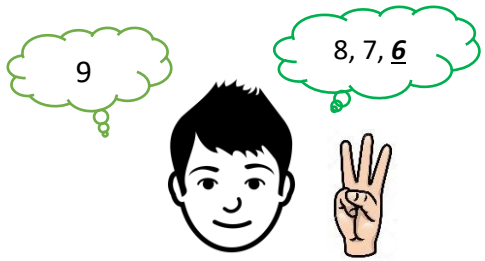
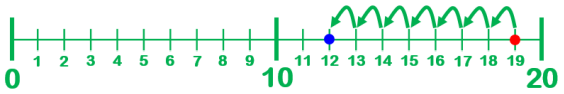
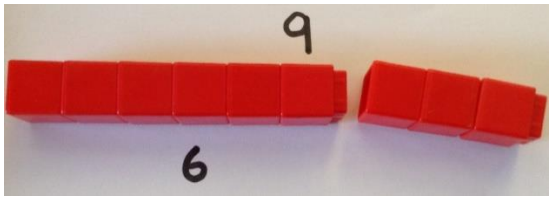
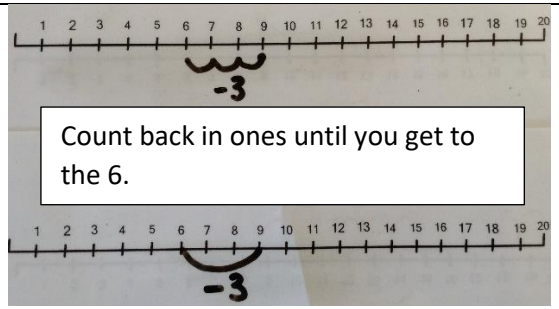
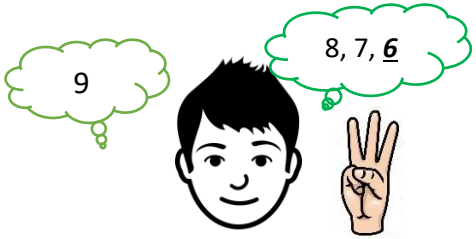
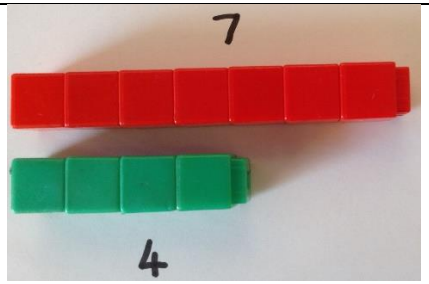
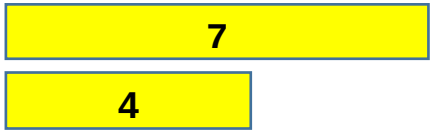
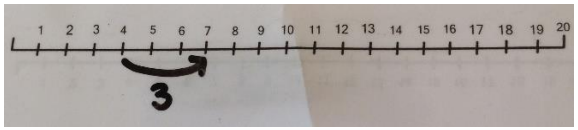
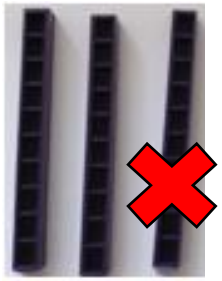
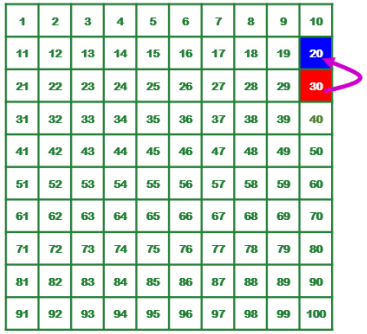
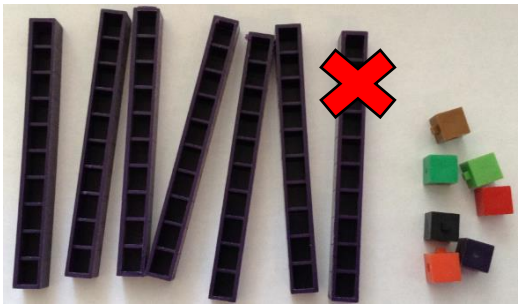
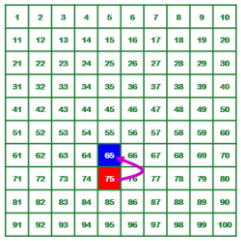
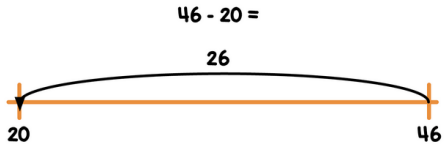
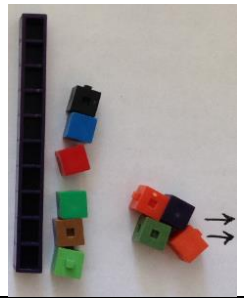
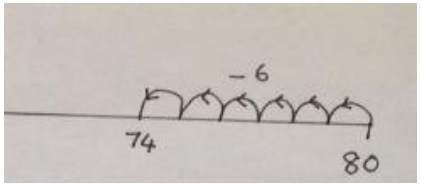
Add a 2 digit number to a 2 digit number	Model combining two groups: 24 + 35 =  25 + 47 =  Make another group of 10 using the ones.	24 + 35 = 59 Start from larger number:  25 + 47 = 	24 + 35 = 59  25 + 47 = 72 because 
Add three 1-digit numbers	7 + 2 + 4  Lay out groups, combine to make ten and count on – or use known number facts.	6 + 5 + 4  Use numberline and known number facts such as making ten.	Use Learn its: 4 + 7 + 6 = 17 Use 4 + 6 = 10 and 10 + 7 = 17. 5 + 7 + 6 = 18 Use Learn it or near double 5 + 6 = 11 and count on.

Subtraction – Reception into Year 1			
Steps	Concrete	Pictorial	Abstract
Take away numbers of objects to 10.	7 take away 2 Show how objects can physically be taken away. 	Cross out drawn objects to show what has been taken away. 	Use my learn its: I know 5 + 2 = 7 so 7 – 2 = 5
Solve a subtraction by counting back Start on first number and take away, counting backwards. Use a numberline. Use mental methods.	9 – 3 = Move objects away from group, counting backwards. 	 	Put 9 in your head, count back 3. What number are you at? Use my learn its: I know 6 + 3 = 9 so 9 – 3 = 6.

Take a 1 digit number from a number to 20.	Use resource such as a beadstring: 	19 – 7 = 12 	19 – 7 = 12 Use mental methods or use my learn its.
Solve a missing number problem. Start on first number. Find out how many you need to take away to get to 6.	9 - ☐ = 6 Start with 9 and take away until you have 6. 	 	Use my learn its: I know 6 + 3 = 9 so the missing number is 3.
Find the difference Compare objects and amounts.	 “I need 3 more to make 7.” “Seven is three more than four.”	How many more to make 7?  	How many more to make 7? What is the difference between 4 and 7? Use my learn its – I know that 4 + ***3*** = 7 and 7 – ***3*** = 4.

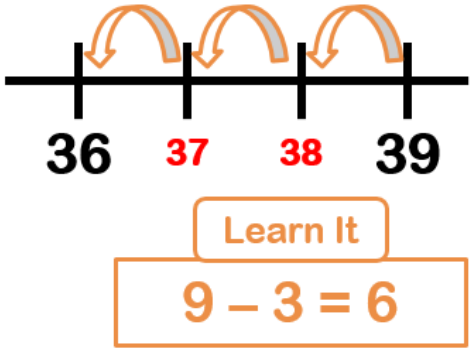
Subtraction - Year 2			
Steps	Concrete	Pictorial	Abstract
Take 10 from a multiple of 10. **Subtract a multiple of 10 from another multiple of 10.**	30 – 10 = 20   3 things – 1 thing = 2 things so 3 tens – 1 ten = 2 tens so 30 – 10 = 20	 **30 – 10 = 20**	30 – 10 = 20 because 3 – 1 = 2 and I can subtract other multiples of 10 in the same way: 80 – 30 = 50 because 8 – 3 = 5
Subtract 10 from a 2 digit number. **Subtract other multiples of 10 from a 2 digit number.**	75 – 10 = 65 	 **75 – 10 = 65** 	75 – 10 = 65 I know I subtract one from the tens digit. I can subtract other multiples of ten from a 2 digit number in this way: 75 - 30 = 45

<table>
<tr>
<td>Subtract a 1 digit number from a multiple of 10.</td>
<td>20 - 6 = 14
Replace a ten with ten ones:
  </td>
<td>80 – 6 =
Sketch numberline and count back.
 
</td>
<td>80 – 6 = 74

because I know that
6 + 4 = 10
and
10 – 4 = 6

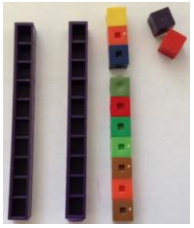
Number bonds for 10!</td>
</tr>
<tr>
<td>Solve 2 digit subtract 1 digit</td>
<td>37 – 5 = 32

7 – 5 = 2
 

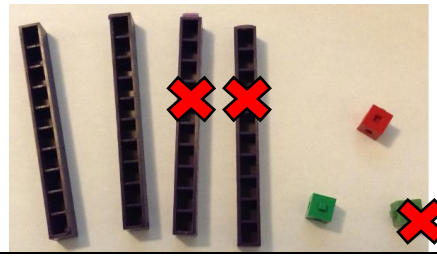
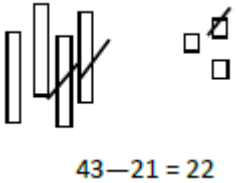
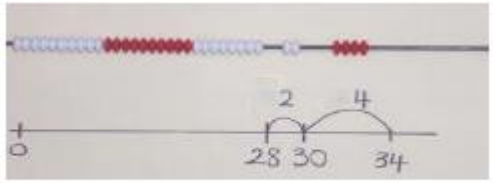
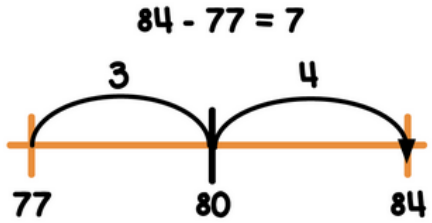
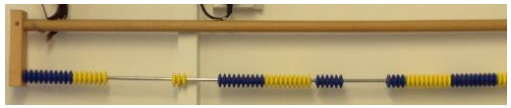
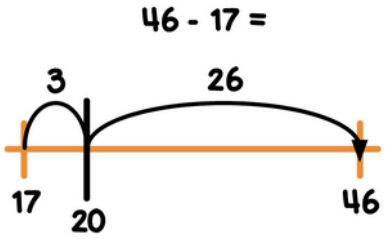
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
<tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr>
<tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr>
<tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr>
</table>
Explore 47 – 5, 57 – 5 etc.</td>
<td>39 – 3 = 36
 
</td>
<td>37 – 5 = 2

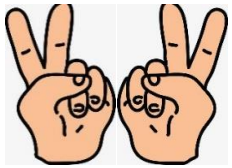
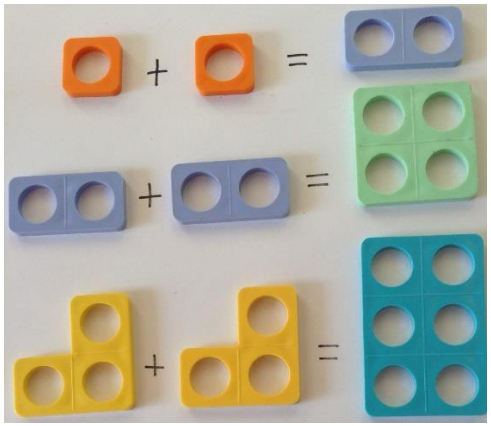
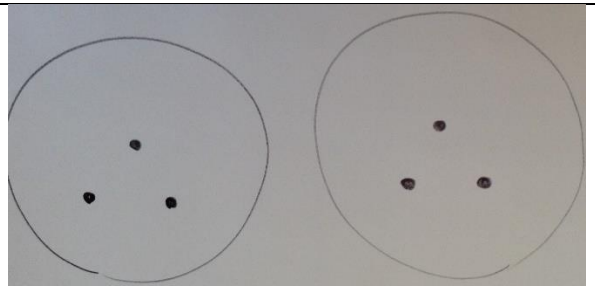
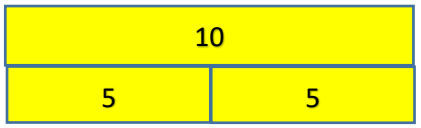
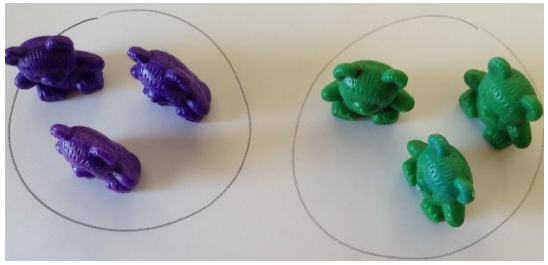
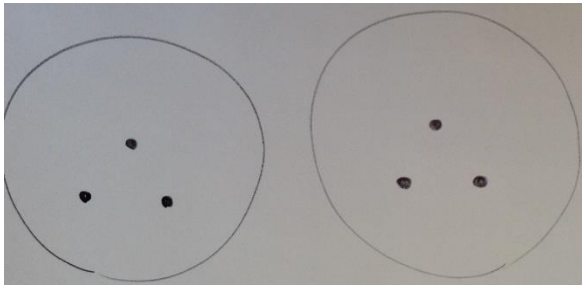
because I know that 2 + 5 = 7

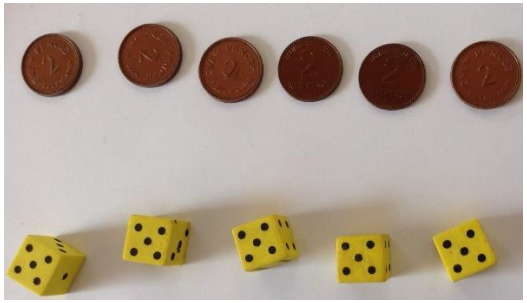
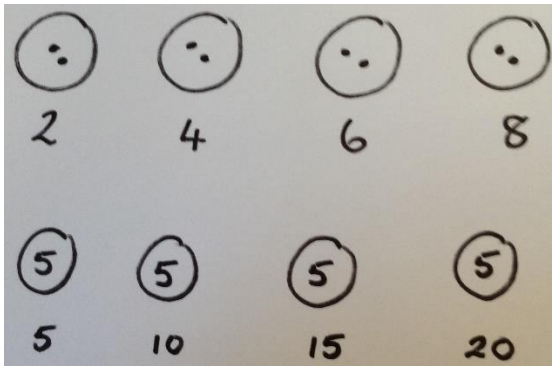
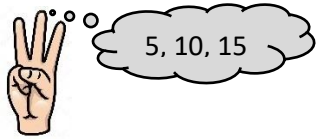
39 – 3 = 36

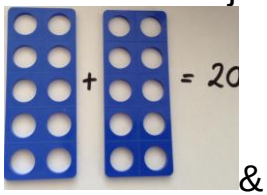
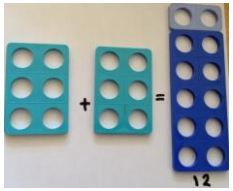
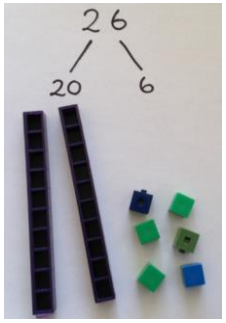
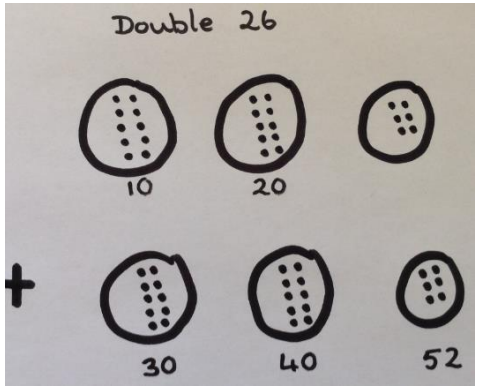
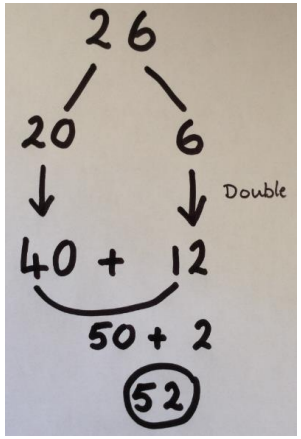
because I know that 6 + 3 = 9</td>
</tr>
<tr>
<td>Solve any 2 digit subtract 1 digit, bridging the multiple of 10.</td>
<td>Model using Dienes rods and ones, replacing one ten with ones:
 
32 – 5 =</td>
<td>32 – 5 = 27
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
<tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr>
<tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr>
<tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr>
</table></td>
<td>I know to bridge the ten or “cross the tens fence”.

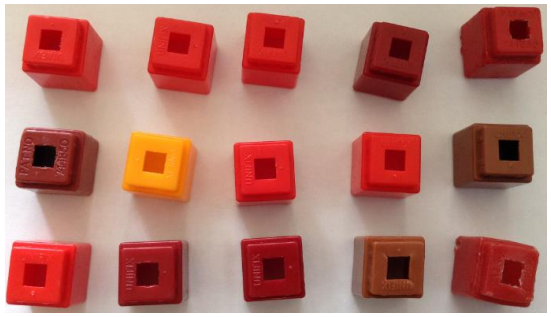
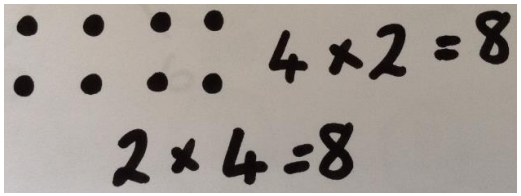
32 – 5 = 27</td>
</tr>
</table>

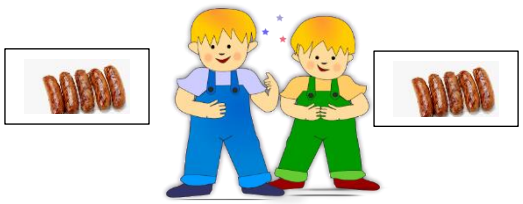
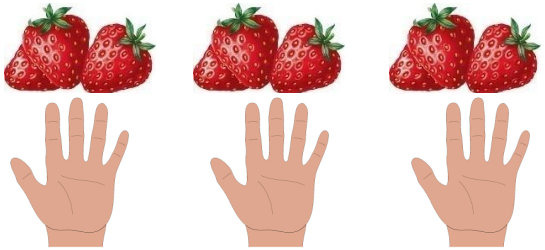
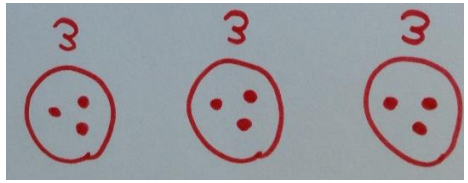
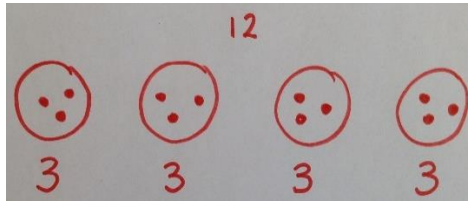
Solve a "friendly" 2 digit subtract 2 digit calculation without regrouping.	43 - 21 = 22 Model taking away the 2 tens and the one: 	Children draw Dienes rods and ones:  43—21 = 22	I know I can subtract the ones digit and the multiple of ten mentally. 43 – 21 = 22
Know the total gap across a multiple of ten.	Children learn that a 2 digit subtract 2 digit calculation is carried out by finding the gaps: Model on a bead bar:  34—28	Children are taught to sketch a numberline:  3 + 4 = 7	I can find and add the two gaps all in my head: 84 – 77 = 7
Find the two gaps in a two digit subtract two digit question. **Solve any 2 digit subtract 2 digit calculation.**	Use a bead bar or bead string to model counting to the next ten and then on to the larger number. Find 46 – 17 =  by counting up from 17 beads to 46. Show 3 beads + 20 beads + 6 beads = 29 beads. Show alongside pictorial numberline.	Find the gap to the next multiple of 10. Jump to the target number Add the jumps together:  3 + 26 = 29	I can find and add the two gaps all in my head: 46 - 17 = 29

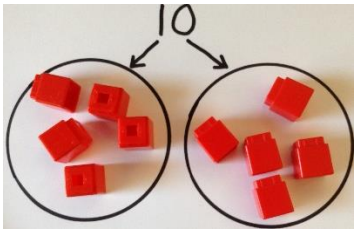
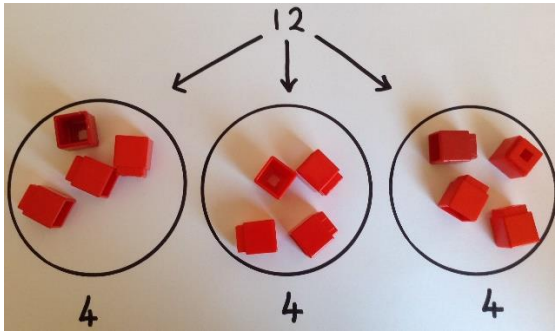
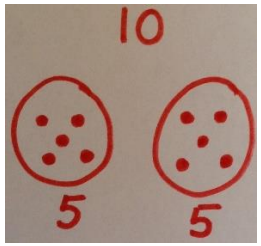
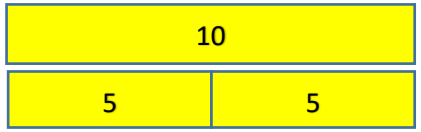
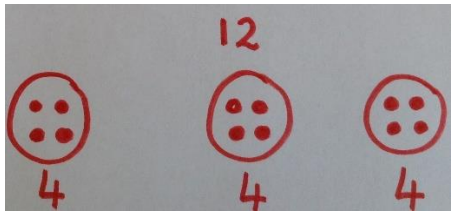
Multiplication – Reception into Year 1			
Steps	Concrete	Pictorial	Abstract
Doubling All doubles to 10+10 are taught as Learn its.	  Etc.	 	Know doubles as Learn its.
Set out groups. **Find the total amount.**	Two groups of three:  Children will count in ones, some counting on from first group.	Draw circles and dots:  Count on from first group.	Two groups of three can be written as 3 X 2 and has the same total as 2 X 3.

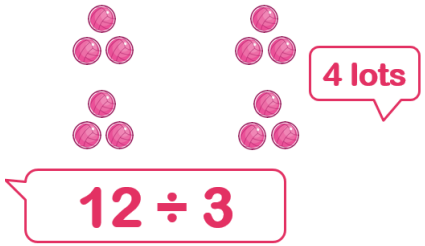
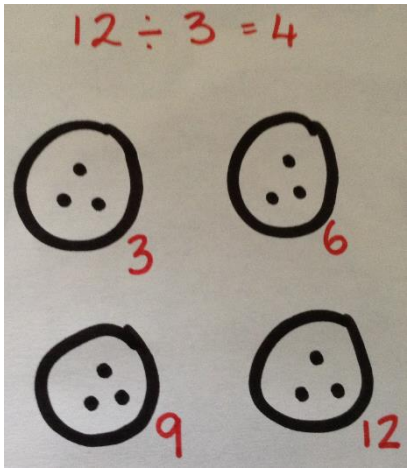
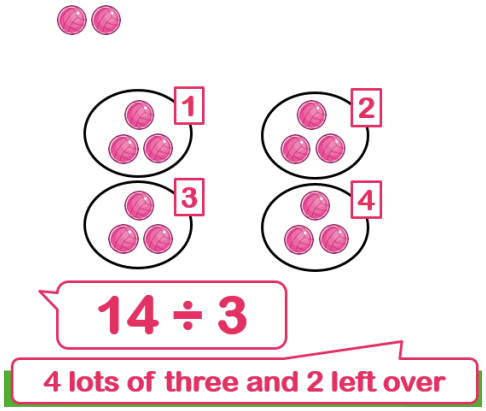
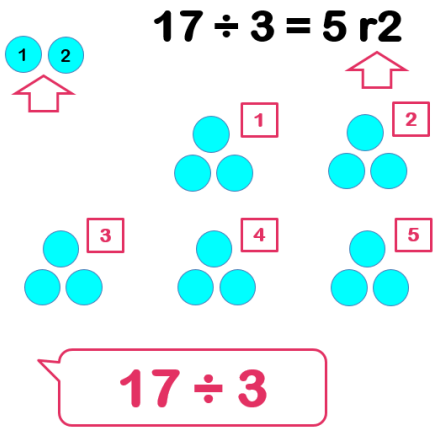
Count in multiples Make link between counting in multiples and finding the total in multiplication problems.	Count 2, 4, 6, 8, 10, 12  Count 5, 10, 15, 20, 25	Draw pictures to support counting. Use fingers to count along in multiples.  	Know the multiples of 2, 5 and 10 and use these to find the totals of these groups when calculating multiplication problems. Begin to count in 3s and 4s.

Multiplication - Year 2			
Steps	Concrete	Pictorial	Abstract
Doubling of 2 digit numbers, e.g. double 26	Children will have done lots of doubling with Numicon and objects:  &  and will understand partitioning using apparatus such as Dienes: 	Children will have strategies for drawing: 	Children will partition a 2 digit number, double the parts and then recombine. Double 26 =  They will also know the inverse. So half of 52 is 26!
Understand multiplication as repeated addition. Leading to: **Solve 1 digit x 1 digit multiplications – 2, 3, 4 and 5 times tables**	4 lots of 2  2 + 2 + 2 + 2	3 lots of 5  5 + 5 + 5 = 3 x 5	3 x 5 = 15 is the same as 5 + 5 + 5 = 15 Know 2, 3, 4 and 5 times tables as Learn Its.

Arrays – showing commutative multiplication	Create arrays to show multiplication sentences: 	Draw arrays to find commutative multiplication sentences: 	Use arrays to write different multiplication sentences and repeated addition:  6 + 6 + 6 + 6 = 24 4 + 4 + 4 + 4 + 4 + 4 = 24 4 x 6 = 24 6 x 4 = 24

Division – Reception into Year 1			
Steps	Concrete	Pictorial	Abstract
Give out objects fairly. Count how many each person was given. Share an even number of objects between two people. Share 3, 6, 9, 12 or 15 objects between 3 people. Share 4, 8, 12, 16 or 20 objects into 4.	10 sausages shared between 2 people.  9 strawberries shared between 3 people. 	Draw dots to find the answer to 9 shared between 3.  Draw dots to find the answer to 12 shared between 4.  	10 shared between 2 = 5 9 shared between 3 = 3 12 shared between 4 = 3 Written story problems.

Share equally to solve division problems. Know halving facts. Use same process for other facts.	Share 10 equally into 2 groups  Share 12 into 3 groups  	   	10 ÷ 2 = 5 I know that half of 10 is 5. Use my doubles Learn its to know halving facts. Use knowledge of counting in groups/multiples. Begin to know other division facts.

Division - Year 2			
Steps	Concrete	Pictorial	Abstract
Solve a division number sentence Leading to: **Use a tables fact to find a division fact (2, 3, 4, 5x tables)**	12 ÷ 3 Take 12 objects and share them into lots of 3:  	 	Use Learn its and fact families to find the answer – short cut the counting out groups of objects: 15 ÷ 5 = 3 because I know 3 x 5 = 15 5 x 3 = 15 15 ÷ 5 = 3 15 ÷ 3 = 5
Solve a division number sentence with remainders	14 ÷ 3  	Draw out groups of dots:  	16 ÷ 3 = I know that 15 is the largest multiple of 3 without going past 16. I know that 15 ÷ 3 = 5 so I know that 16 ÷ 3 = 5 r 1

Review

This policy is a working document and will be subject to amendment at any time to reflect changes in working practices within school. It will be formally reviewed in 2023.