St Joseph's Catholic Primary School, Worcester

'Following Jesus in all we do'

MATHEMATICS CALCULATION POLICY

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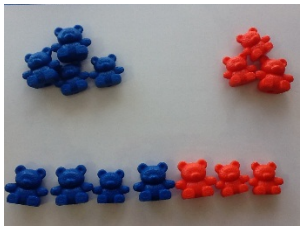
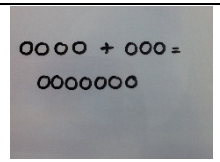
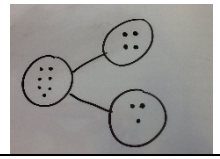
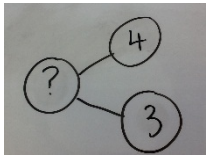
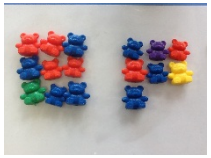
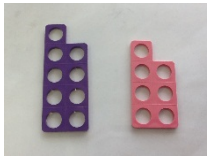
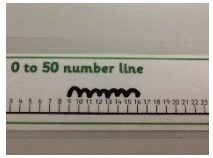
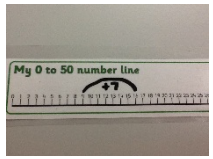
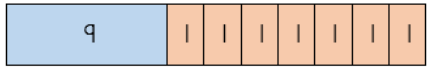
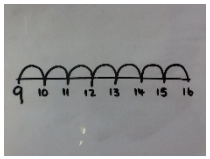
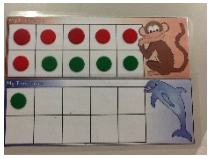
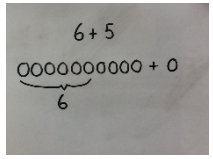
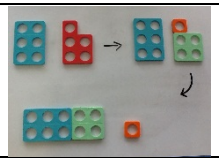
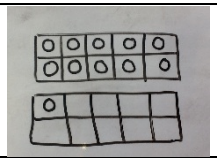
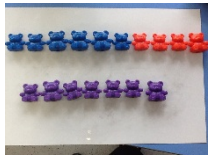
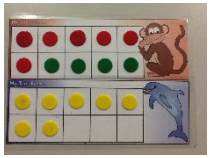
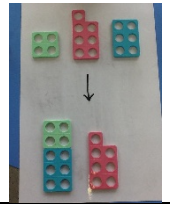
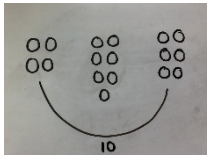
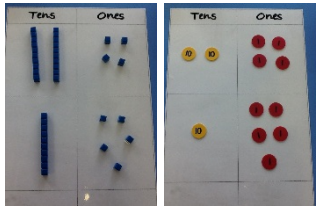
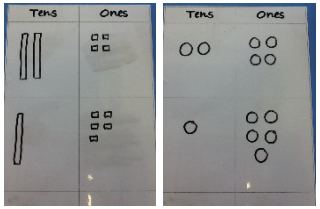
Date: September 2020
Review Date: September 2021

St Joseph's Catholic School Calculation Policy

Addition			
Objectives/Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole.	Use resources to add two numbers together as a group or in a bar model. 4 + 3 = ?	Children represent the resources using dots/circles.	4 + 3 = 7 or 7 = 4 + 3

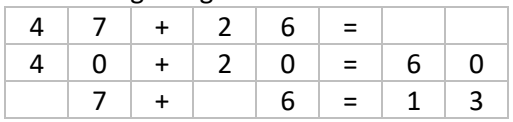
		 They could put each part on a part whole model too. 	Four is a part, three is a part and the whole is seven. 
Starting at the bigger number and counting on.	Use resources to add two numbers together by starting on the biggest number and counting on.  Use Numicon, start on the biggest number and count on. 	9 + 7 on a number line by starting on the largest number and counting on in ones.  9 + 7 on a number line by starting on the largest number and doing one jump of seven.  Bar models that encourage children to count on, rather than count all. 	9 + 7 = 16 Put the largest number in your head and count on to find your answer. Using a blank number line: What is 7 more than 9?  What is the sum of 7 and 9? What is the total of 9 and 7? ____ = 9 + 7 7 + 9 = ____
Regrouping to make 10.	6 + 5 Start with the bigger number and use the smaller number to make 10.  Use Numicon to make 10 first then see what is left over.	6 + 5 Use pictures or a number line. Regroup or partition the smaller number to make 10.  Children can draw the ten frame and counters.	6 + 5 = ____ If I am at six, how many more do I need to make 10? How many more do I add on now? Children develop an understanding of equality. 6 + ____ = 11 6 + 5 = 5 + ____ 6 + 5 = ____ + 4

<table>
<tr>
<td></td>
<td>  </td>
<td>  </td>
<td></td>
</tr>
<tr>
<td>Adding three single digits.</td>
<td>4 + 7 + 6 = 17
Look for number bonds to 10 first. Put 4 and 6 together to make 10. Add on the 7.
  
Use Numicon to make 10 first then add remaining amount.
  </td>
<td>Add together three groups of objects. Draw a picture to recombine to make 10 first. Then add on the remainder.
  </td>
<td>Combine the two numbers that make 10 and then add on the remainder.

6 + 4 = 10
10 + 7 = 17</td>
</tr>
<tr>
<td>Column method – no regrouping</td>
<td>24 + 15 =
Add together the ones first then add the tens. Use Dienes first before moving onto place value counters.
  </td>
<td>24 + 15 =
Children can draw the counters or Dienes to help them solve additions.
 
Draw a bar model:
  </td>
<td>24 + 15 = ____
____ = 24 + 15

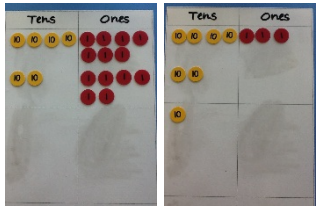
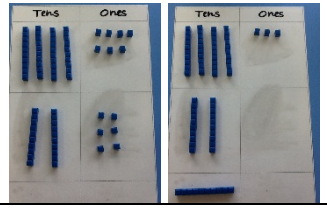
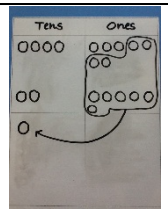
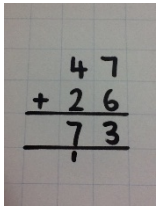
Simple column method
 
Word problems
In Year 3, there are 24 children and in Year 4, there are 15 children. How many children in total?</td>
</tr>
<tr>
<td>Column method - regrouping</td>
<td>47 + 26 =

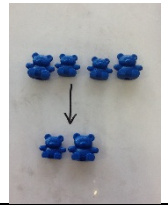
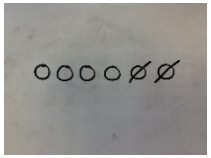
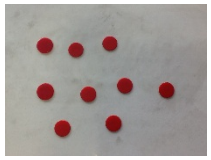
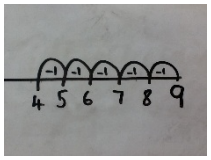
Make both numbers on a place value grid.

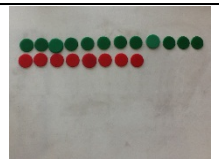
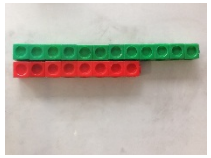
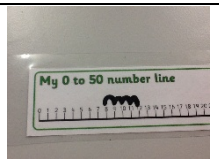
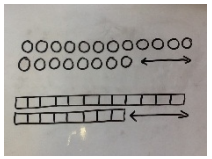
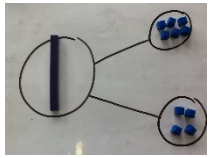
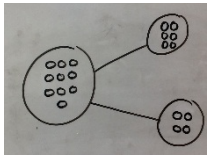
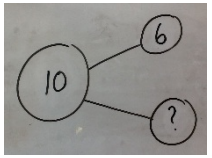
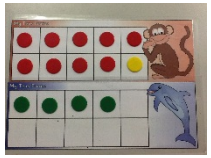
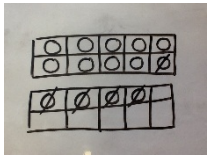
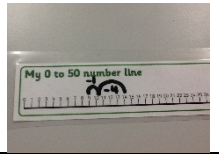
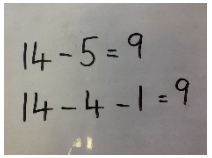
Add up the units and exchange ten ones for one ten.</td>
<td>47 + 26 =
Children can draw a pictorial representation of the columns and place value counters. Children circle when they make an exchange.</td>
<td>Partitioning using column method
  </td>
</tr>
</table>

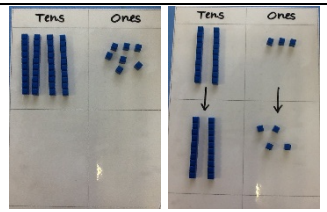
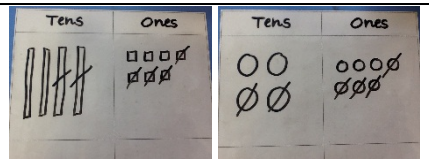
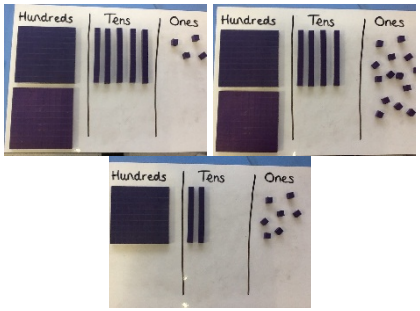
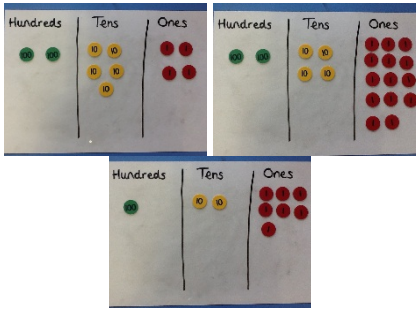
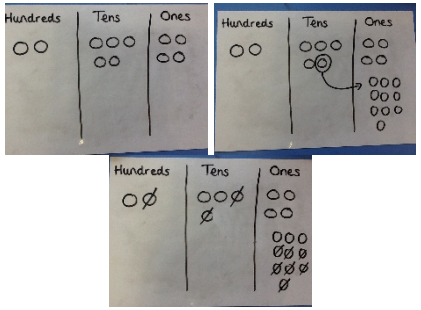
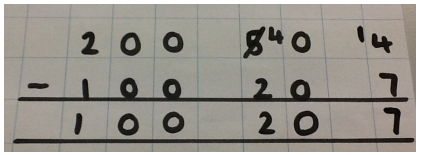
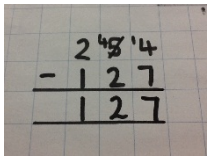
	2	4					
+	1	5					
	3	9					

4	7	+	2	6	=		
4	0	+	2	0	=	6	0
	7	+		6	=	1	3

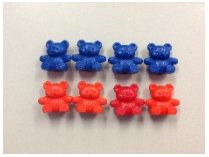
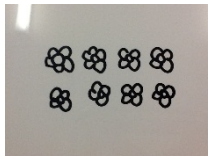
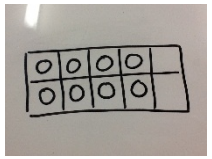
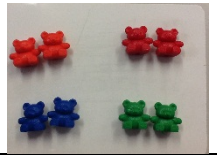
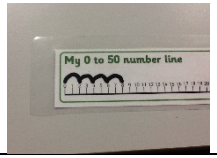
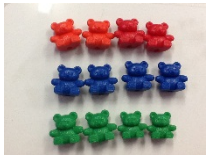
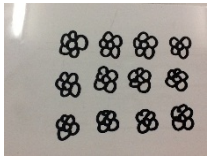
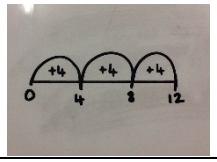
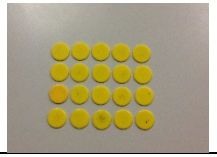
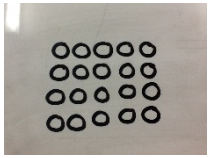
	Count all columns.  Do the same with Dienes.  	 	Children complete column method showing exchanges underneath. 

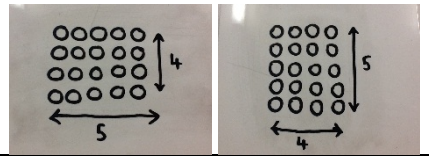
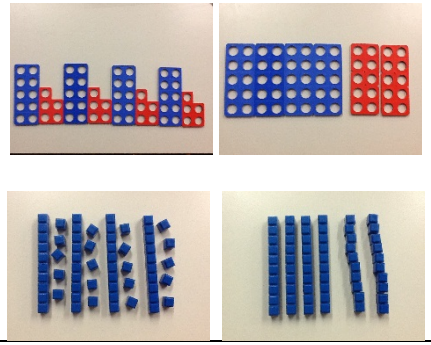
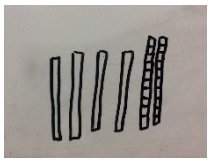
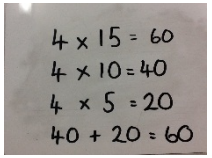
Subtraction			
Objectives/Strategies	Concrete	Pictorial	Abstract
Talking away ones	Use physical objects, counters, cubes to show how objects can be taken away. 6 – 2 = 4 	Cross out drawn objects to show what has been taken away. 6 – 2 = 4 	6 – 4 = _____ _____ = 6 – 4
Counting back	Use objects and move them away from the group. As you take them away, count backwards in ones as you go. 9 – 5 = ? 	Count back on a number line or number track. Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can be used when subtracting two 2 digit numbers.	Put the larger number in your head, count back. What number are you at? Use your fingers to help. Use a blank number line to count back. 
Finding the difference	Comparing amounts with objects to find the difference.	Using a number line or number track, count on to find the difference.	Word problems: Hannah has 12 sandwiches.

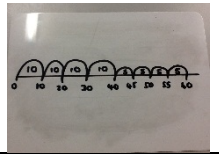
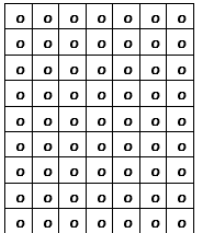
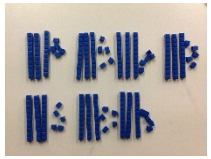
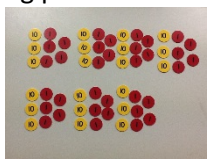
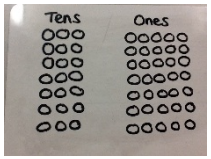
	 Use basic bar models with items to find the difference. 	 Children draw the objects they have used to calculate the difference.  Draw bar models to find the difference between 2 numbers.	Helen has 8 sandwiches. Find the difference between the number of sandwiches. Jim has 12 balls. Kev has 8 balls. How many more balls does Jim have than Kev?
Part, part, whole model	Link to addition – use to reinforce inverse.  If 10 is the whole and 6 is one of the parts. What is the other part? 10 – 6 = ?	Use a pictorial representation of objects to show the part, part, whole model. 	Use numbers within the part, part, whole method. 
Making 10	Using ten frames. 14 – 5 = ? 	Children to present the ten frame pictorially and discuss what they did to make 10.  Use a number line to jump back to ten first. 	14 – **5** = ? Partition the 5 to make a ten first.  How many do we need to take off to reach a ten? How many do we have left to take off? 14 – 4 = 10 10 – 1 = 9
Column method – no regrouping	Using a tens and ones frame, use Dienes to make the bigger number then take the smaller number away. 47 – 24 = ?	Draw Dienes or place value counters alongside written calculation to help show working out.	47 – 24 = 23 Can be done in different ways: 40 + 7 - 20 + 4 20 + 3

			This will lead to clear written column subtraction 47 - 24 23
Column method with regrouping	Use Dienes to start. Practise with subtractions using one exchange only to begin with.  Then move onto using place value counters. 254 – 127 = Start with the ones. Can I take away 7 from 4 easily? I need to exchange one of my tens for ten ones. Now it can be done.  Replicate with more than one exchange. Show the children how the concrete method links to the written method alongside your	Draw the counters onto a pace value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make. 	Children start their formal written method by partitioning the number into clear place value columns.  Move onto a more compact method. 

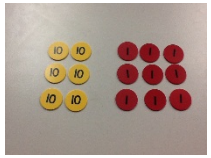
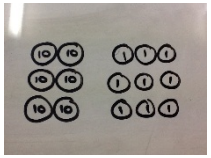
	working. Cross out the numbers when exchanging and show where we write our new amount.		

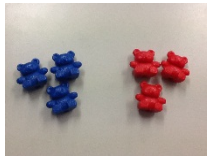
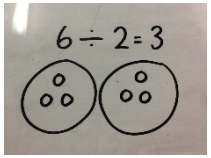
Multiplication			
Objectives/Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show to double a number. 	Draw pictures to show how to double a number.  	Partition a number and then double each part before recombining. 16 x 2 = ? ? = 2 x 16 16 + 16 = ?
Counting in multiples	Counting in multiples supported by concrete objects in equal groups. 	Use a number line or pictures to continue to support counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30
Repeated addition	Use different objects to add equal groups. 3 x 4 = 4 + 4 + 4 	Children to represent the practical resources in a picture.  Use a bar model:  Use a number line to jump in 4's.	Write addition and multiplication sentences to describe objects and pictures. 3 x 4 = ? 4 + 4 + 4 = ? Use a blank number line. 
Arrays	Create arrays using counters/ cubes to show multiplication sentences 4 x 5 =? 	Children to represent arrays pictorially. 	Use an array to write multiplication sentences and reinforce repeated addition. 4 x 5 = 20 5 x 4 = 20 4 + 4 + 4 + 4 + 4 =20 5 + 5 + 5 + 5 = 20

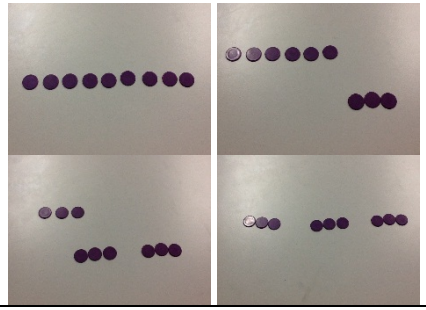
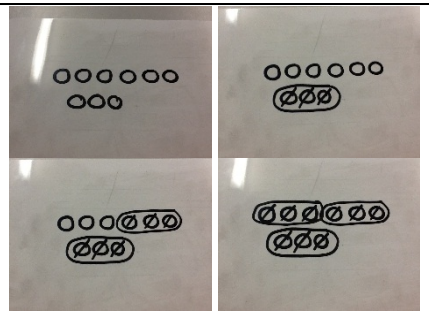
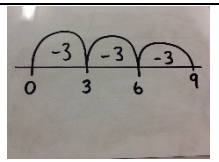
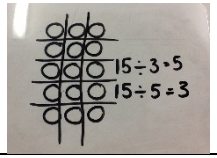
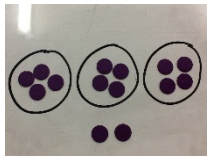
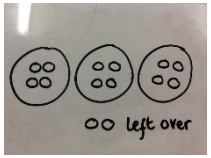
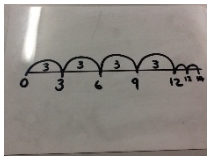
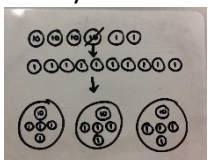
<table>
<tr>
<td></td>
<td></td>
<td>Draw arrays in different rotations to find commutative multiplication sentences.
4 x 5 = 20
5 x 4 = 20
 
</td>
<td></td>
</tr>
<tr>
<td>Partition to multiply</td>
<td>Use Numicon and Dienes
4 x 15 = ?
  </td>
<td>Children to represent concrete manipulatives pictorially.
4 x 15 = ?
  </td>
<td>Children to be encouraged to show the steps they have taken.
 

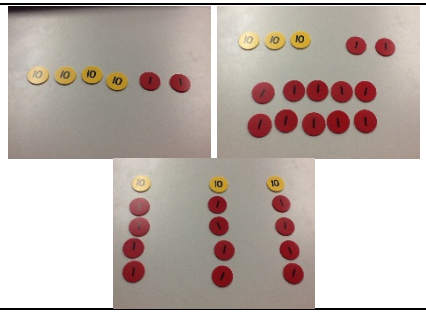
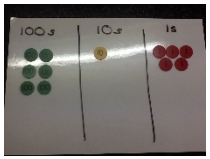
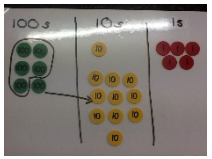
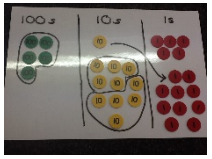
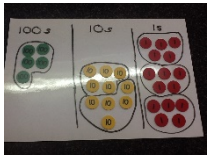
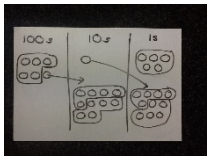
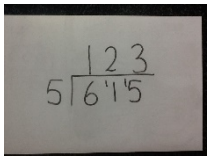
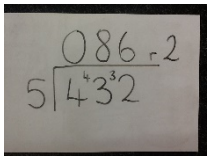
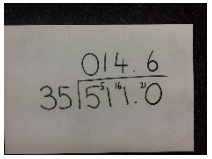
A number line can also be used.
  </td>
</tr>
<tr>
<td>Grid method</td>
<td>Show the link with arrays to first introduce grid method.
35 x 7 =
 
Move onto using Dienes.
 
Move onto using place value counters.
 
Make note of any exchanges needed.</td>
<td>Children can draw place value counters to show their thinking.
 
</td>
<td>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.
<table><tr><td>x</td><td>30</td><td>5</td></tr><tr><td>7</td><td>210</td><td>35</td></tr></table>
210 + 35 = 245

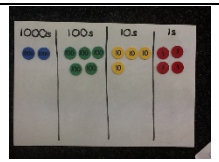
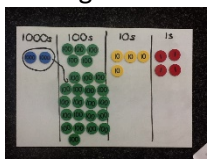
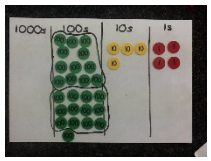
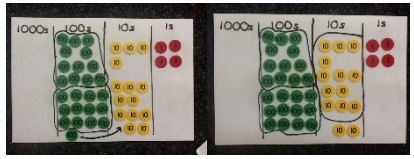
Move onto multiplying by a 2-digit number.
<table><tr><td>x</td><td>30</td><td>5</td><td></td></tr><tr><td>10</td><td>300</td><td>50</td><td>= 350</td></tr><tr><td>7</td><td>210</td><td>35</td><td>= 245</td></tr></table>
595</td>
</tr>
</table>

Column multiplication	Use place value counters. 3 x 23 = ? 	Children represent the counters pictorially.  Bar models and number lines can support learners when solving problems alongside formal written methods.	Children record what they are doing to show understanding. 3 x 23 = ? 3 x 20 = 60 3 x 3 = 9 60 + 9 = 69 23 x 3 69 Move onto two 2-digit numbers. 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768

Division			
Objectives/Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	Use a range of objects. 6 ÷ 2 = ? 	Represent the sharing pictorially using pictures or shapes.  Use a bar model to help. Think of the bar as the whole. Split it into the number of groups you are dividing by and work out how many would be in each group. ? | ?	Share 6 fish between 2 tanks. 6 ÷ 2 = ? Children should be encouraged to use their times table facts.
Repeated subtraction	Using objects start with the whole amount and take away groups of the number you are	Represent repeated subtraction pictorially.	Abstract number line to represent the equal groups that have been subtracted.

	dividing in. How many groups have you made? 9 ÷ 3 = ? 		
Division within arrays	Link division to multiplication by creating an array and thinking about the number sentences that can be created. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the array into groups to make multiplication and division sentences. 	Find the inverse of multiplication and division sentences by creating four linking number sentences. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15
Division with a remainder	14 ÷ 3 = ? Divide objects between groups and see how much is left over. 	Draw objects in groups and see how many are left over.  Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder. 	Complete written divisions and show the remainder using r. 14 ÷ 3 = 4 r 2 Children should be encouraged to use their times table facts. Children could represent repeated addition on a number line. 
Sharing using place value counters	42 ÷ 3 = 14	Children to represent the place value counters pictorially. 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 <u>42 = 30 + 12</u> 30 ÷ 3 = 10 <u>12 ÷ 3 = 12</u> 10 + 4 = 14

			
Short division	Using place value counters to group. 615 ÷ 5 = ? 1. Make 615 using place value counters.  2. How many groups of 5 hundreds can you make with 6 hundred counters?  3. Exchange 1 hundred for 10 tens.  4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones.  6. How many groups of 5 ones can you make with 15 ones?	Represent the place value counters pictorially. 	Children do the calculation using short division scaffold.  Move onto divisions with a remainder.  Finally move onto divisions with decimal places. 
Long division	Using place value counters. 2544 ÷ 12 = ?	Represent the place value counters pictorially, noting any exchanges.	Use long division method to show 2544 ÷ 12 = ?

	 We can't group 2 thousands into groups of 12 so we will exchange them.  We can group 24 hundreds into groups of 12 which leaves with 1 hundred.  After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.  After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 groups of 12, which leaves no remainder.