Avenue Junior School – Calculation Policy

Last updated: September 2017

Addition:

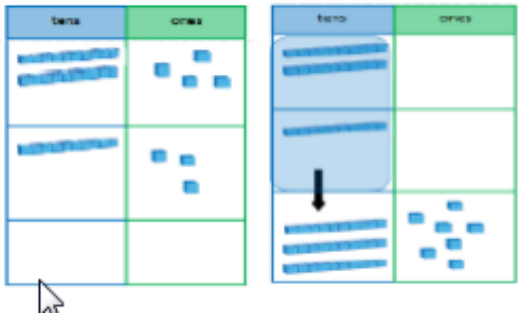
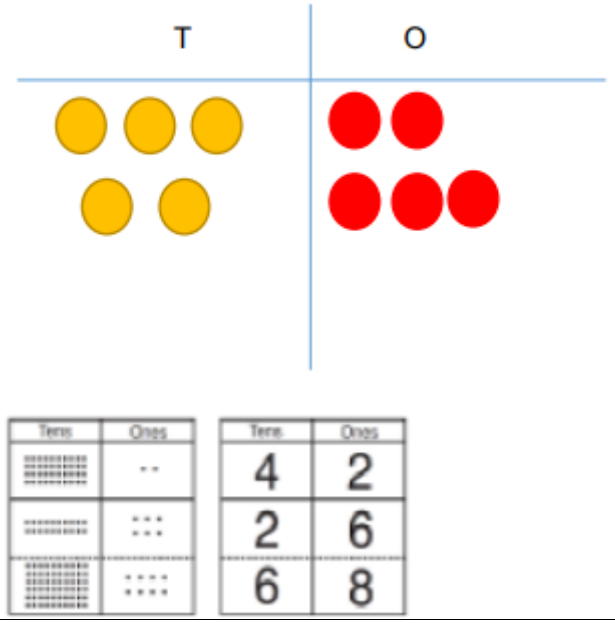
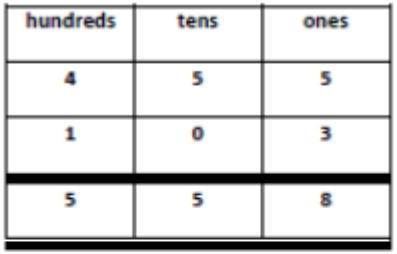
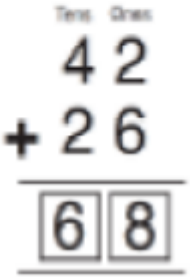
Key Language: sum, total, parts and wholes, plus, add, altogether, more, ‘is equal to’ ‘is the same as’.

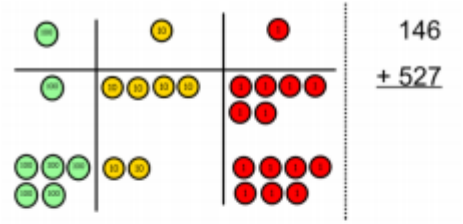
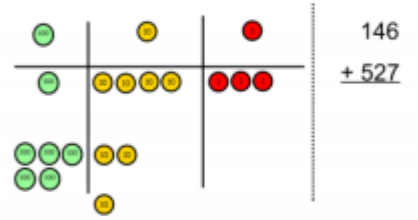
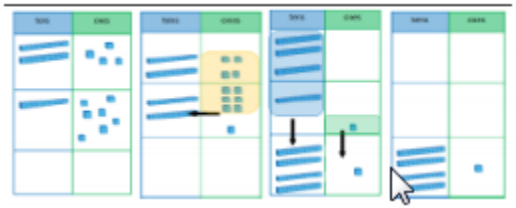
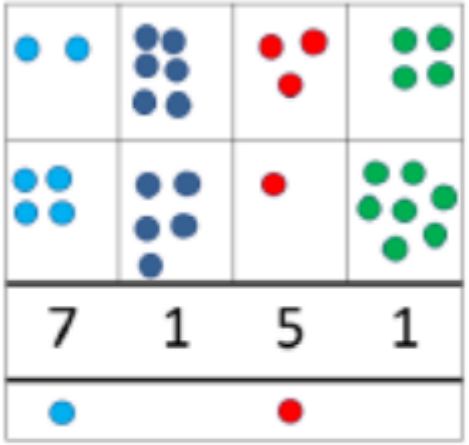
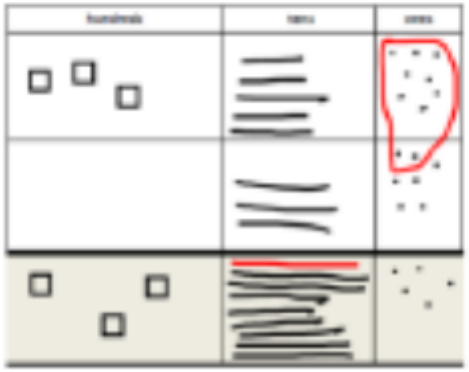
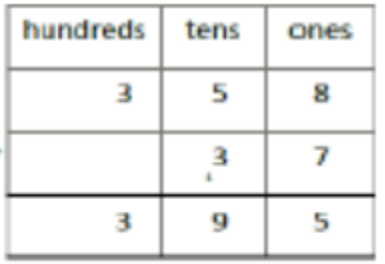
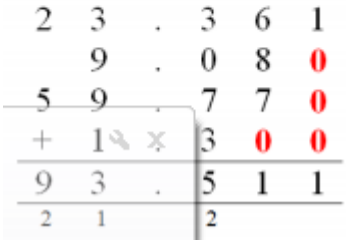
Year 3: add numbers with up to 3 digits, using the formal written method of columnar addition.

Year 4: add numbers with up to 4 digits, using the formal written methods of columnar addition, where appropriate.

Year 5: add whole numbers with more than 4 digits, including using formal written methods.

Year 6: no specific curriculum objective.

	Concrete	Pictorial	Abstract
Column addition with no exchanging.	24 + 15= Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters. 	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.  	 

Column addition with exchanging.	Make both numbers on a place value grid.  146 + 527 Add up the units and exchange 10 ones for one 10.  146 + 527 Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added. As children move on to decimals, money and decimal place value counters can be used to support learning. 	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.  	 Start by partitioning the numbers before moving on to clearly show the regrouping below the addition. 72.8 + 54.6 127.4 1 1 20 + 5 40 + 8 60 + 13 = 73 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. 536 + 85 621 1 1 

Subtraction:

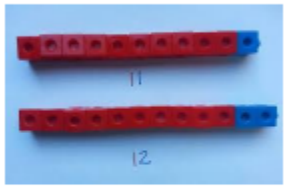
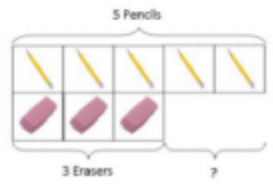
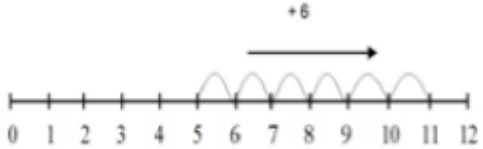
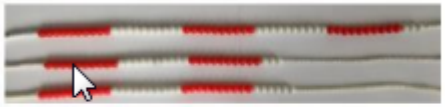
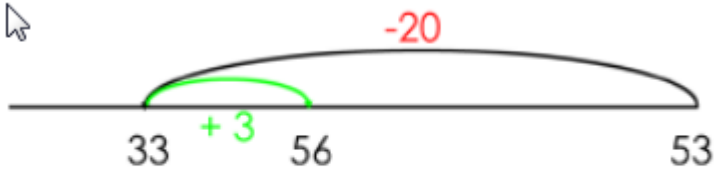
Key Language: less than, the difference, subtract, fewer, decrease

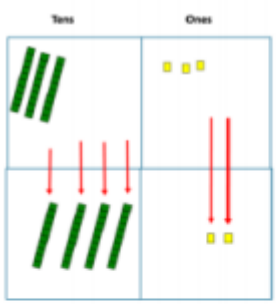
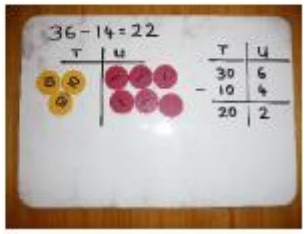
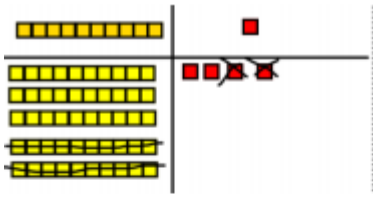
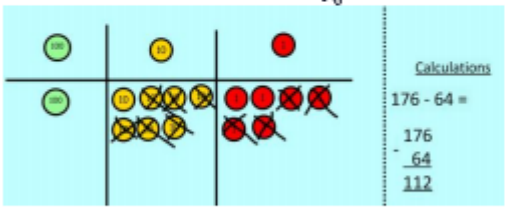
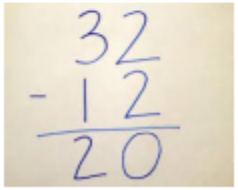
Year 3: subtract numbers with up to 3 digits, using the formal written method of columnar subtraction.

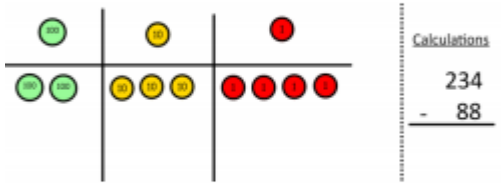
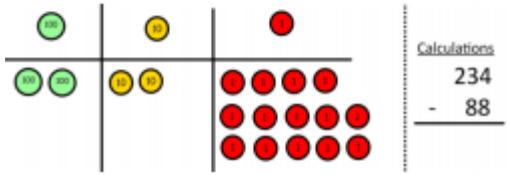
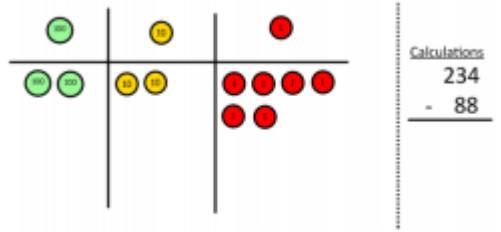
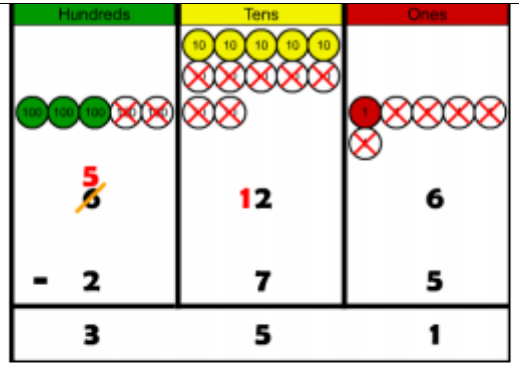
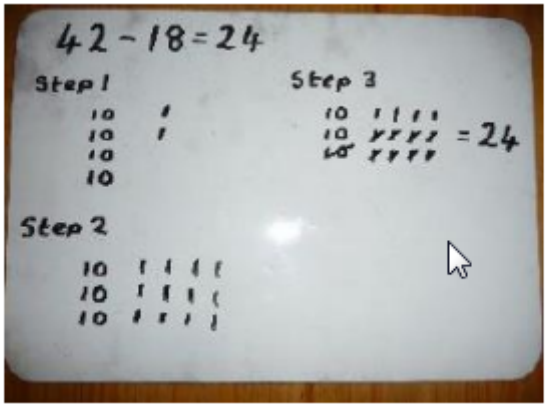
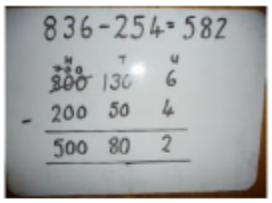
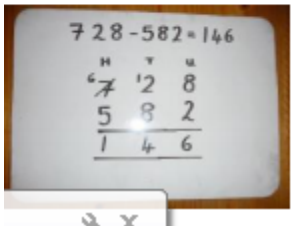
Year 4: subtract numbers with up to 4 digits, using the formal written methods of columnar subtraction, where appropriate.

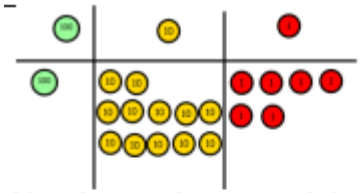
Year 5: subtract whole numbers with more than 4 digits, including using formal written methods.

Year 6: no specific curriculum objective.

	Concrete	Pictorial	Abstract
Finding the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference  Use basic bar models with items to find the difference	 Count on to find the difference. Draw bars to find the difference between 2 numbers.	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
Subtracting tens and adding extra ones	 53 – 17 = 36	 53 – 17 = 36	53 – 17 = 36 Round 17 to 20. 53 – 20 = 33 20 – 17 = 3 (numbe bonds) 33 + 3 = 36

Column method without exchanging	 Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first. 	  Draw the Base 10 or place value counters alongside the written calculation to help to show working. 	47 − 24 = 23 40 + 7 − 20 + 4 20 + 3 This will lead to a clear written column subtraction. 

Columnar subtraction with exchanging	Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters  Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.  Now I can subtract my ones.  Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make. When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.  	 Children can start their formal written method by partitioning the number into clear place value columns.  Moving forward the children use a more compact method. This will lead to an understanding of subtracting any number including decimals. 5 12 1 2 6 3 . 0 - 2 6 . 5 2 3 6 . 5

	 Calculations 234 - 88 Now I can take away eight tens and complete my subtraction  Calculations ~~234~~ - 88 146 Show children how the concrete method links to the written method alongside the working. Cross out the numbers when exchanging and show where we write our new amount.		

Multiplication

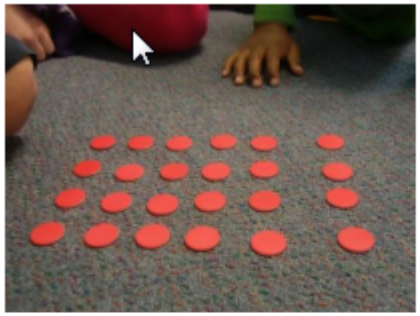
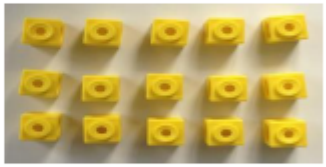
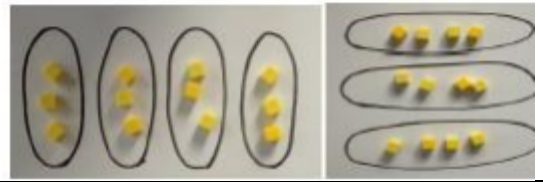
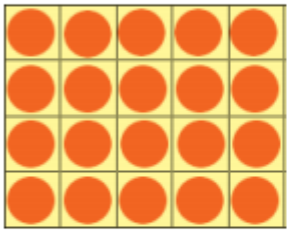
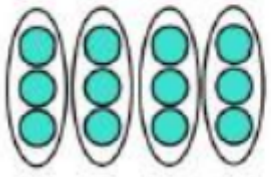
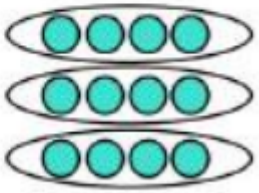
Key Language: Commutative, factor, product, multiple, repeated addition, array,

Year 3: calculate two digits numbers by one digit numbers, progressing to the formal written method.

Year 4: multiply two digit and three digit numbers by a one-digit number using formal written method.

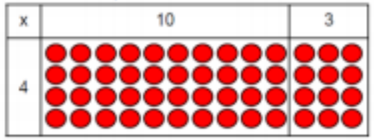
Year 5: multiply numbers up to four digits by a one or two digit number using a formal written method, including long multiplication for two digit numbers.

Year 6: multiply multi-digit numbers up to four digits by a two digit number using the formal written method of long multiplication.

	Concrete	Pictorial	Abstract
Arrays showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences.   	Draw arrays in different rotations to find **commutative** multiplication sentences.  4 × 2 = 8 2 × 4 = 8  2 × 4 = 8 4 × 2 = 8  Link arrays to area of rectangles.   12 = 3 × 4 12 = 4 × 3	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

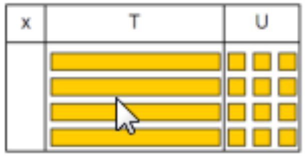
Grid Method (Dienes moving to PV grids when appropriate)

Show the link with arrays to first introduce the grid method.



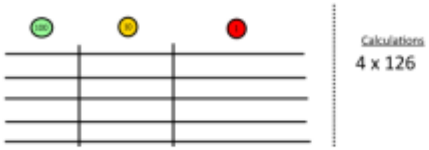
4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method.

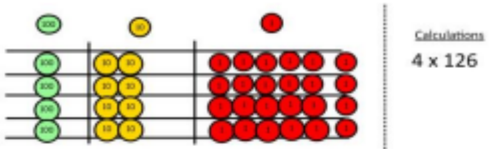


4 rows of 13

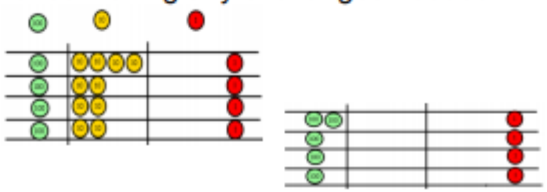
Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.



Fill each row with 126.



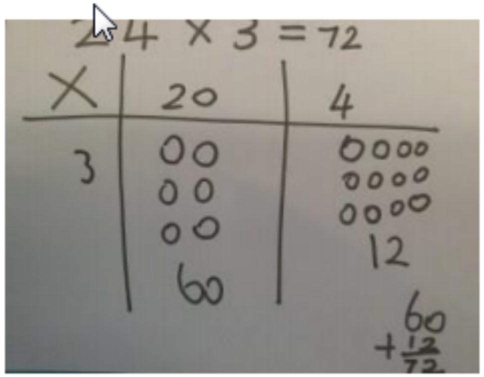
Add up each column, starting with the ones making any exchanges needed.



Then you have your answer.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.

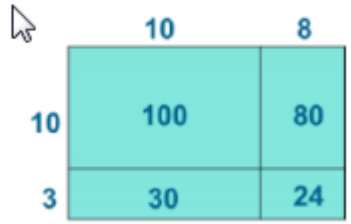


Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

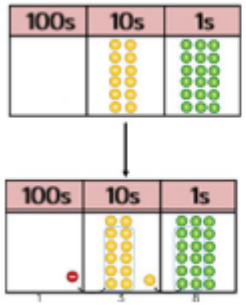
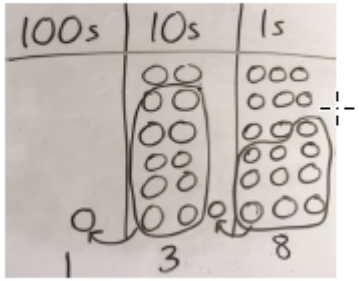
×	30	5
7	210	35

210 + 35 = 245

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.



X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

<table>
<tr>
<td>Short Multiplication – multiplying by a 1 digit number</td>
<td>Formal column method with place value counters.
6 x 23
 
</td>
<td>Children to represent the counters/base 10, pictorially
e.g. the image below.
 
</td>
<td>Formal written method
6 x 23 =
23
x 6
138
1 1</td>
</tr>
<tr>
<td>Long Multiplication</td>
<td colspan="2">If children have a secure understanding of short multiplication, they can apply this to the abstract long multiplication method.</td>
<td>2 3 1
1342
x 18
13420
10736
24156
1</td>
</tr>
</table>

Division:

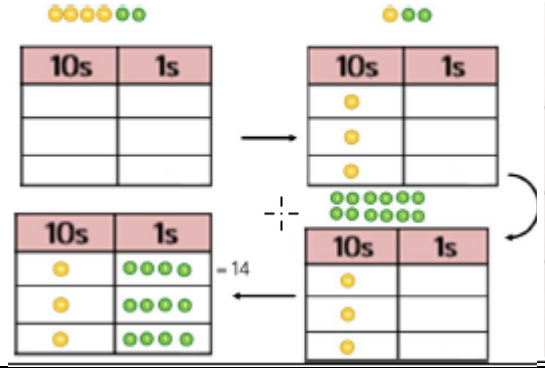
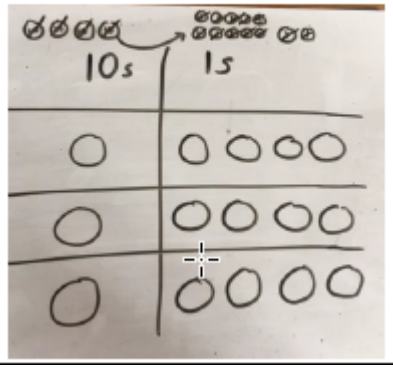
Key Language: share, group, divisor, equal parts, remainder, divisible (by), fraction (of)

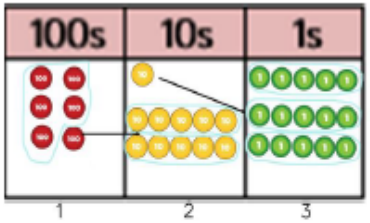
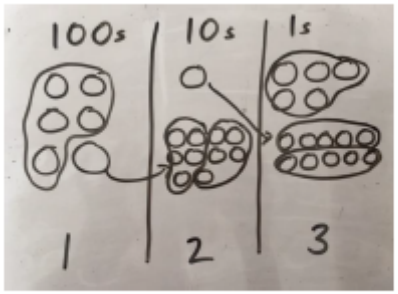
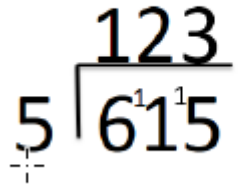
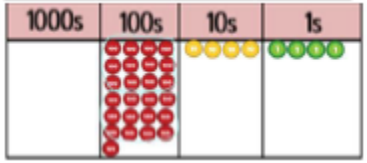
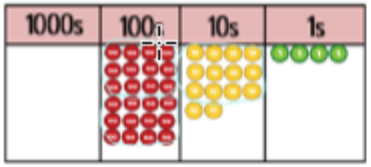
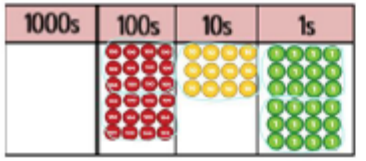
Year 3: write and calculate two digit numbers divided by one digit numbers, using mental and progressing to formal written methods.

Year 4: continuing practicing year 3 using two digit and three digit numbers divided by a one digit number, and use know facts from multiplication tables to mentally divide.

Year 5: divide numbers up to four digits by a one digit number, using the formal written method of short division and interpret remainders appropriately for the context.

Year 6: divide numbers up to four digits by a 2 digit whole number using the formal written method of long division and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate to the context. Divide numbers up to four digits by a one digit number, using the formal written method of short division and interpret remainders appropriately for the context.

	Concrete	Pictorial	Abstract
	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 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

Short Division	**Short division** using place value counters to group. 615 ÷ 5  1. Make 615 with 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 to the calculation using the short division scaffold. 
Long Division	**Long division** using place value counters 2544 ÷ 12  We can't group 2 thousands into groups of 12 so will exchange them.  We can group 24 hundreds into groups of 12 which leaves with 1 hundred. 02 12 | 2544 24 1  After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens. 021 12 | 2544 24 14 12 2  After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder. 0212 12 | 2544 24 14 12 24 24 0	