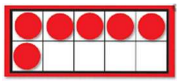
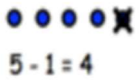
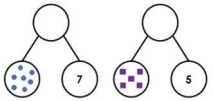
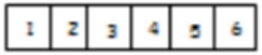
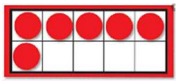
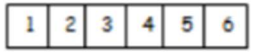
Mount Pleasant Primary School

Maths Calculation Policy

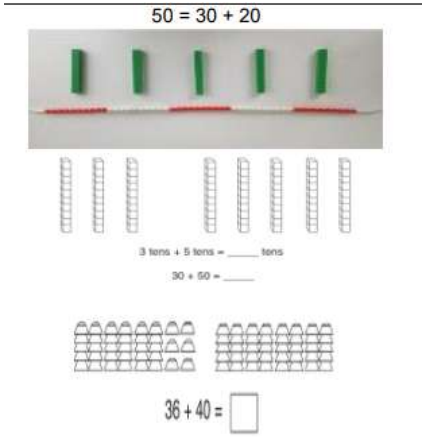
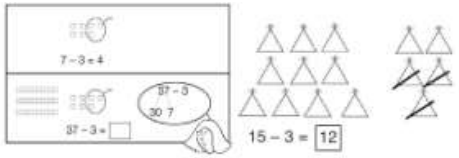
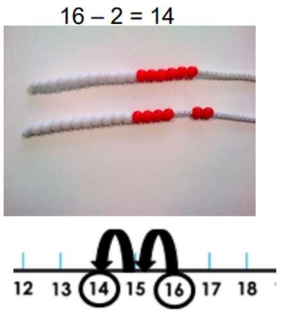
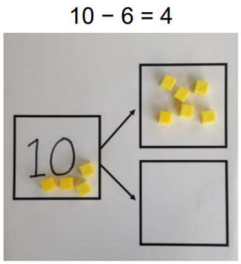
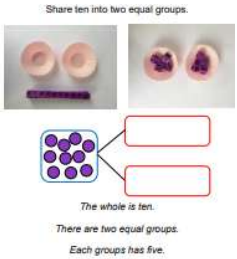
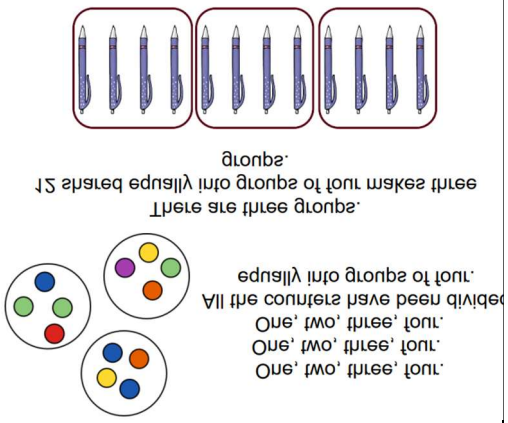
EYFS

Foundation Stage- By the end of FS we expect children to:			
Addition	**Subtraction**	**Multiplication**	**Division**
ELG states that children will have a deep understanding of number to 10, including the composition of each number; subitise up to 5. Automatically recall number bonds to 5 and some number bonds to 10, including double facts. Numicon shapes, 5/10 frames are introduced straight away and can be used to: • Recognise amounts • Identify 1 more/less • Combine pieces to add • Find number bonds • Add by counting on Children can record this by printing or drawing around Numicon pieces.   Children begin to combine groups of objects using concrete apparatus. (cubes, counters, numicon, fingers) 	**ELG states that children will automatically recall number bonds to 5, including subtraction facts, and some number bonds to 10.** Children begin with mostly concrete apparatus and pictorial representations. Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left. Concrete apparatus models the subtraction of 1 object away from 5.  5 - 1 = 4 Construct number sentences verbally or using cards to go with practical activities using concrete apparatus. *"In the fruit bowl there are 4 bananas, I have eaten 1. How many are left?" (Physically removing 1 object and counting how many are left)*  Children make a record in marks, words or symbols of subtraction activities already carried out.	**ELG states that children should be able to explore and represent patterns within numbers up to 10, including double facts:** The link between addition and multiplication is introduced through doubling. Numicon is used to visualise the repeated adding of the same number. These can then be drawn around or printed as a way of recording.  A range of objects are also used to add equal groups such as fingers, cubes, toys. Children begin with concrete apparatus  *"How many groups of 2 are there?"* Real life contexts and use of practical equipment to **<u>count in repeated groups of the same size:</u>**	**The ELG states that children should be able to explore and represent patterns within numbers up to 10, including how quantities can be distributed equally.** Children need to see and hear representations of divisions as both grouping and sharing. Division can be introduced through halving. Children begin with mostly practical representations linked to real life context. **<u>Sharing Model</u>** *"I have 6 sweets. I want to share them with my friend. How many will we have each?*  Part-part whole model can be used alongside to use concrete objects or marks.  Children are to give verbal division number sentences with a verbal explanation and then have a go at recording the calculation that has been carried out.

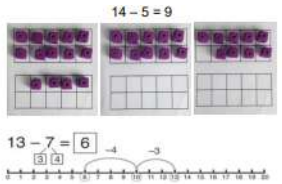
Construct number sentences verbally or using numeral cards to go with practical activities or pictorial representations.  Children are encouraged to read number sentences aloud in different ways. *"3 add 2 equals 5" "5 is equal to 3 add 2"* Children make a record using marks, pictures, words, or symbols of addition activities already carried out. Use part-part whole model to add amounts or investigate number bonds.  Solve problems using fingers.  Number tracks will be introduced alongside to count up on and find one more.	Solve simple problems using fingers.  Number tracks can be introduced to count back and find one less alongside 5/10 frames.   *"What is 1 less than 9?* Number lines are used alongside number tracks and practical apparatus to solve subtraction calculations. Children count back under the number line.  **Children will need opportunities to look at and talk about different models and images as they move between representations.** *Games and songs can be a useful way to begin using vocabulary involved in Subtraction e.g. Five little men in a flying saucer.*	 "How many wheels are there altogether?" **Count aloud and with objects in 1s and 2s** **Vocabulary** **The same, equal amounts, double, doubling, groups of, sets of, lots of, multiply**	**Vocabulary** **Share, sharing, equally, the same amount, group of, half, halving, 2 equal groups/parts, how many, same as, dived into/by, left, left over**

 "What is 1 more than 4? 1 more than 13?" Number lines are used alongside practical apparatus to solve addition calculations and word problems.  **Children will need opportunities to look at and talk about different models and images as they move between representations.** *Games and songs can be a useful way to begin using vocabulary involved in addition. E.g. Alice the Camel.* **Vocabulary** **More, add, plus, total, addition, altogether, count on, equal to, as many as, is the same as**	**Vocabulary** **Less than, count back, takeaway, fewer, subtract, minus, how many have gone/or are left?**		

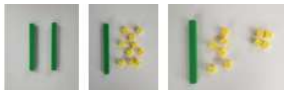
Year 1

Addition	Subtraction	Multiplication	Division
Adding multiples of ten: understand that it is a ten and not a one and that a '2' digit in the tens column has a value of twenty. Link to known number facts. E.g. '2 + 3 is equal to 5. So 2 tens + 3 tens is equal to 5 tens. 	**Taking away from the ones:**   **Counting back:**  **Part-part-whole:** 	**Skip counting in multiples of 2, 5, 10 from 0:**  *5, 10, 15, 20*  *2, 4, 6, 8* **Making equal groups and counting the total:**  *There are four **equal groups** of two. There are eight altogether. The **whole** is eight.*	**Sharing into groups (Partitive division):**  **Grouping objects (Quotative division):** 

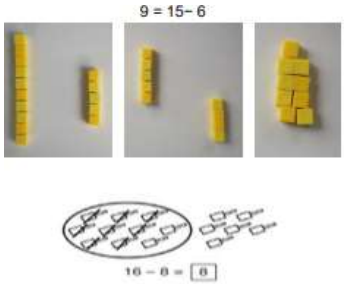
Make ten strategy. To subtract a 1-digit number from a 2- digit number:



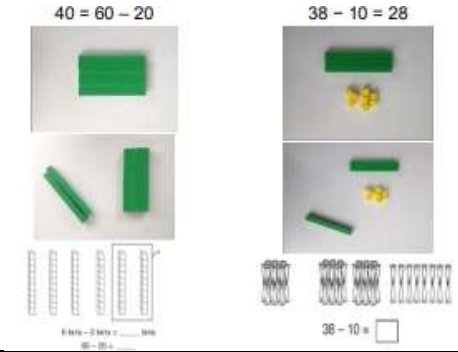
Regroup a ten into ones:



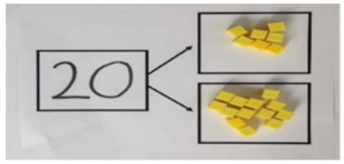
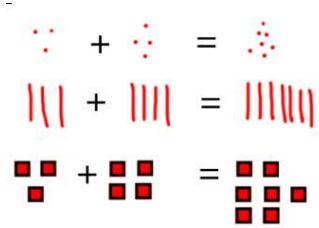
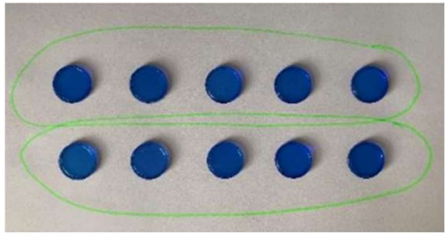
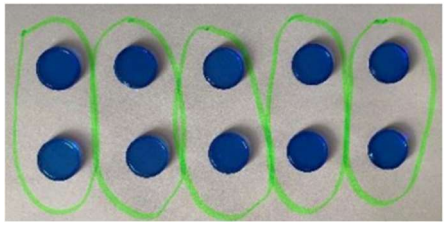
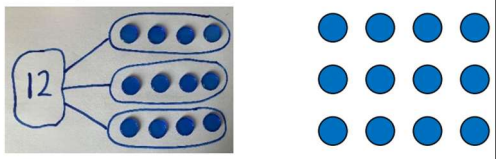
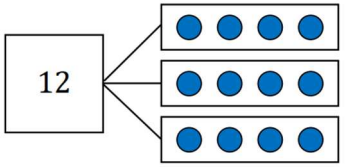
Taking away from the tens:

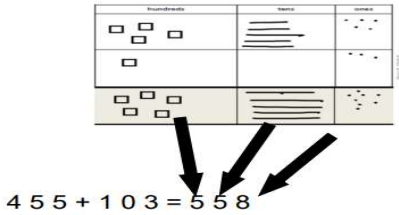
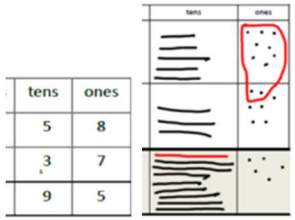
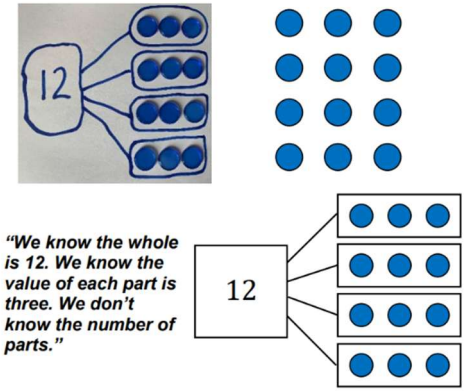


Subtracting multiples of 10:

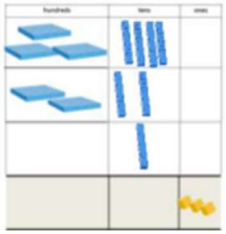
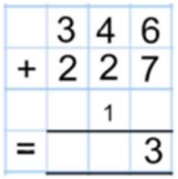
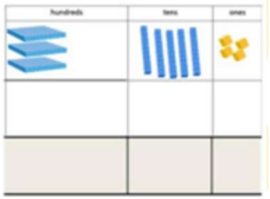
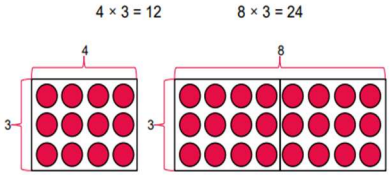
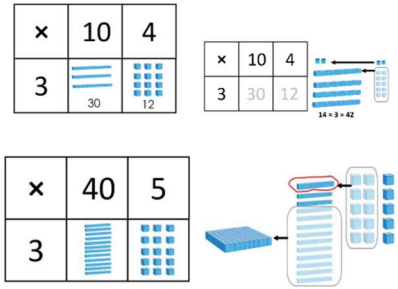
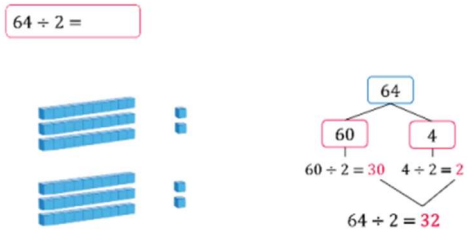


Year 2

Addition	Subtraction	Multiplication	Division
Part-part-whole:  20 = 17 + 3 20 = 3 + 17 20 – 3 = 17 20 – 17 = 3 **Using known facts to create derived facts:**  3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 70 **Make 10 Strategy:** 38 + 15 = 2 13 10 3	**Make 10. Parts can be subtracted in any order.** 42 - 15 = 2 13 10 3 **Partitioning to subtract: Column not expanded should we be exchanging a ten? We have this year for addition and subtraction** 3 5 4 – 1 2 6 2 3 2	**Arrays – rows and columns:**  2 equal groups, each with a value of 5. 2 x 5 = 10  5 equal groups each with a value of 2. 5 x 2 = 10	**Sharing objects into a given number of groups (Partitive division):** *There are 12 children altogether.* *There are three rows on the carpet.* *How many children will there be in each row?*  ***"We know the whole is 12. We know there are three par*** ***We don't know the value of the parts."*** 

Partitioning to add without regrouping:  **Column method with regrouping:**  			**Grouping objects into sets of equal groups (Quotative division):** *There are 12 children altogether.* *The children sit on the carpet in rows of three.* *How many rows will there be?* 

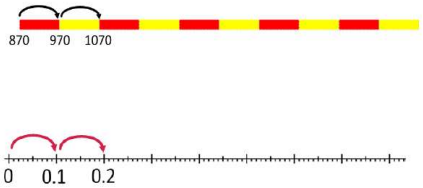
Year 3

Addition	Subtraction	Multiplication	Division
Represent work pictorially or with concrete manipulative:  **Written method:**  $\begin{array}{r} 346 \\ +\ 227 \\ \hline 1 \\ = \quad\ 3 \end{array}$	**Represent work pictorially or with concrete manipulatives:**  **Written method:** $\begin{array}{r} 354 \\ -\ 126 \\ \hline 232 \end{array}$	**Doubling one factor, doubles the product:**  **Use known facts:** $3 \times 2 = 6 \quad 30 \times 2 = 60$  **2-digit numbers with partitioning:**  	**Dividing a 2-digit by a 1-digit number:** 

Year 4

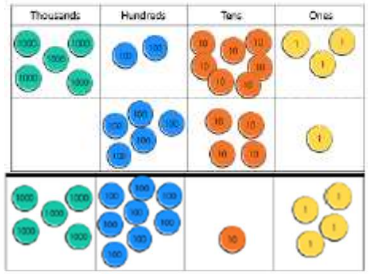
Addition

Counting forwards and backwards:



Pay particular attention to boundaries where regrouping happens more than once and so more than one digit changes.
E.g. 990 + 10 or 19.9 + 0.1

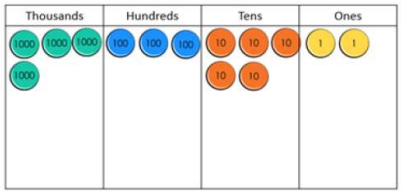
Representations and written column methods:

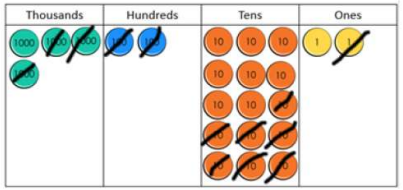


		5	2	7	3
	+		5	4	1
		5	7	1	4
			1		

Subtraction

Written column methods:

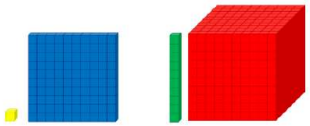




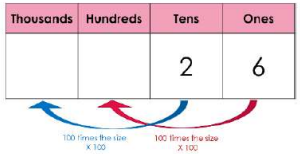
$$\begin{array}{r} 4\,{}^{2}\not{3}\,{}^{1}5\,2 \\ -\ 3\,2\,7\,1 \\ \hline 1\,0\,8\,1 \end{array}$$

Multiplication

Multiplication as scaling:

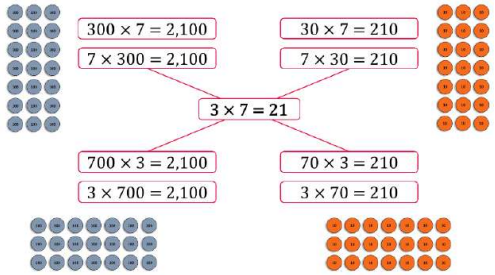


One hundred is one hundred times the size of one one.
One thousand is one hundred times the size of one ten.



26 made 100 times the size is 2,600.
26 multiplied by 100 is equal to 2,600.
First, we had 26 ones. Now we have 26 hundreds.

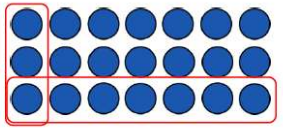
Use known facts:



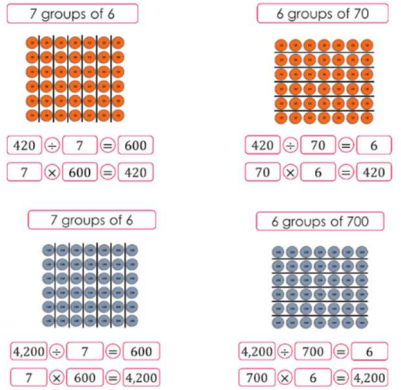
Division

Derived facts:

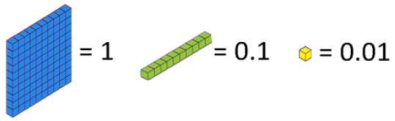
3 × 7 and 21 ÷ 3



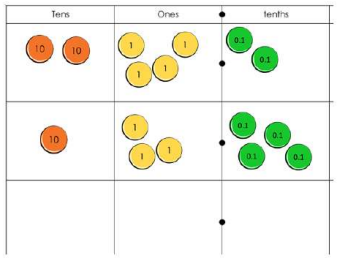
If I know 42 ÷ 7 = 6, then I know:



Calculating with decimal numbers:



24.2 + 13.4 =



Short multiplication of a 2-digit number by a 1-digit number:

Expanded layout

		2	3
	×		3
			9
	+	6	0
		6	9

Compact layout

		2	3
	×		3
		6	9

Short multiplication of a 3-digit number by a 1-digit number:

		5	1	2
×				3
				6
			3	0
	1	5	0	0
	1	5	3	6

To calculate 512 × 3, represent the number 512. Multiply each part by 3, regrouping as needed.

		5	1	2
×				3
	1	5	3	6

Short division of 2-digit numbers by 1-digit number:

39 ÷ 3

		1	3
	3	3	9

75 ÷ 3

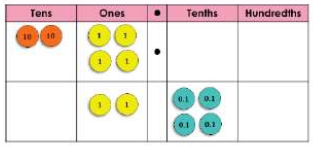
Two groups of three tens can be made from seven tens.
There is one ten remaining.

		2	5
	3	7	5

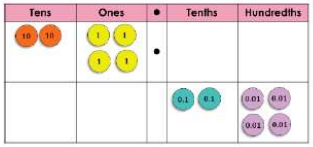
One ten can be regrouped for ten ones, making 15 ones altogether.

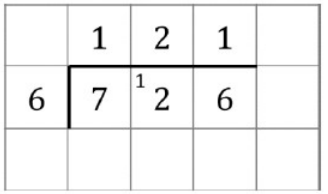
Five groups of three ones can be made from 15 ones, with no ones remaining.
75 divided by three is equal to 25.

24 ÷ 10 = 2.4

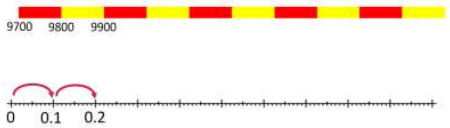
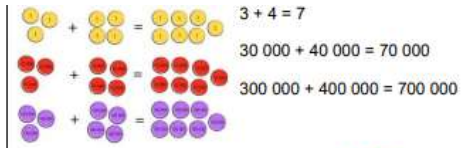
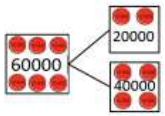
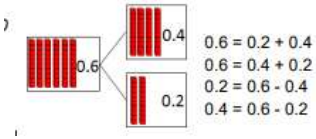
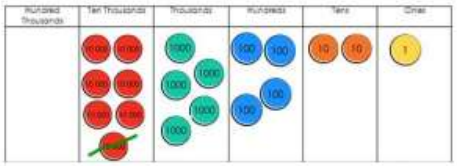
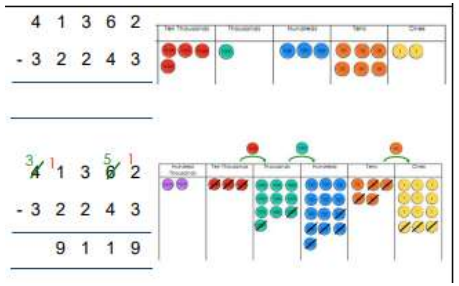
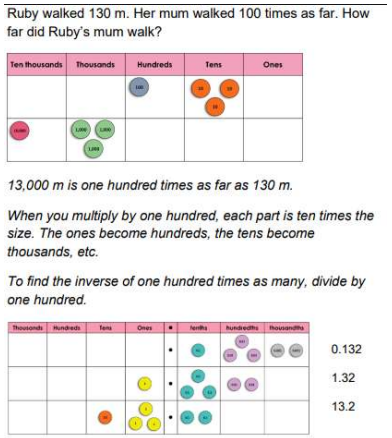
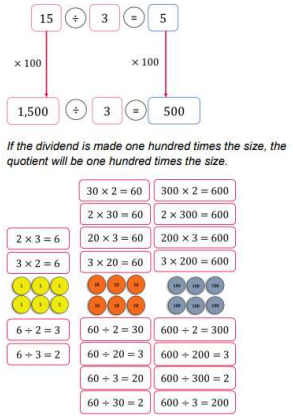


24 ÷ 100 = 0.24



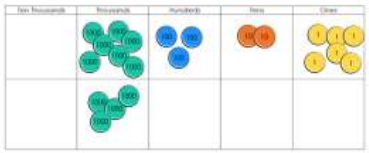
			Short division of a 3-digit number by a 1-digit number: 726 ÷ 6 

Year 5

Addition **STICK WITH THE FORMAL METHODS ONLY IN SUMMER for all operations**	Subtraction **STICK WITH THE FORMAL METHODS ONLY IN SUMMER for all operations**	Multiplication **STICK WITH THE FORMAL METHODS ONLY IN SUMMER for all operations**	Division **STICK WITH THE FORMAL METHODS ONLY IN SUMMER for all operations**
Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000  Counting sticks and number lines:  **Using known facts and understanding of place value to derive**  3 + 4 = 7 30 000 + 40 000 = 70 000 300 000 + 400 000 = 700 000 20 000 + 40 000 = 60 000 40 000 + 20 000 = 60 000 60 000 - 40 000 = 20 000 60 000 - 20 000 = 40 000   0.6 = 0.2 + 0.4 0.6 = 0.4 + 0.2 0.2 = 0.6 - 0.4 0.4 = 0.6 - 0.2	**Partitioning into place value amounts (canonical partitioning):** 75 221 – 14 300 = 75 221 – 10 000 – 4000 – 300  **Represent pictorially with a number line, starting on the right and having the arrows jump to the left:**  **Written column methods for subtraction:**  Regroup subtraction above.	**Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000:**  Ruby walked 130 m. Her mum walked 100 times as far. How far did Ruby's mum walk? *13,000 m is one hundred times as far as 130 m.* *When you multiply by one hundred, each part is ten times the size. The ones become hundreds, the tens become thousands, etc.* *To find the inverse of one hundred times as many, divide by one hundred.* 	**Deriving facts from known facts:**  *If the dividend is made one hundred times the size, the quotient will be one hundred times the size.* **Using knowledge of multiples to divide:**

Partitioning into place value amounts:

4650 + 7326 = 7326 + 4000 + 600 + 50



Representing on a number line:

Partitioning in different ways:

6785 + 2325 = 6785 + 15 + 200 + 2110

The strategy can be used with decimal numbers, Make one:

14.7 + 3.6 = 14.7 + 0.3 + 3.3 = 15 + 3.3

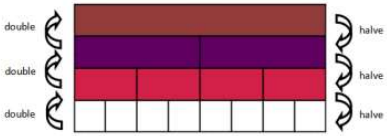
Using known facts and place value to derive multiplication facts:

Multiply by 4 by doubling and doubling again

e.g. 16 × 4 = 32 × 2 = 64

Divide by 4 by halving and halving again

e.g. 104 ÷ 4 = 52 ÷ 2 = 26



Multiply by 8 by doubling three times

e.g. 12 × 8 = 24 × 4 = 48 × 2 = 96

Divide by 8 by halving three times

e.g. 104 ÷ 8 = 52 ÷ 4 = 26 ÷ 2 = 13

Multiply by partitioning one number and multiplying each part Distributive law

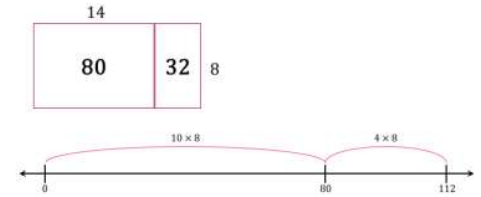
a × (b + c) = a × b + a × c

Written methods:

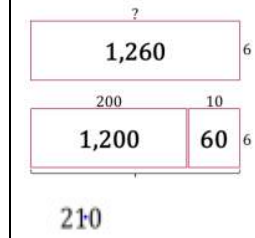
Multiplying 3- or 4-digit number by a 1-digit number using the formal written method of short multiplication

		5	1	2
×				3
	1	5	3	6

	2	3	1	3
×				3
	6	9	3	9

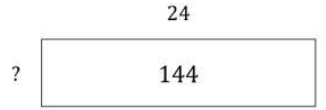


1260 ÷ 6 = 1200 ÷ 6 + 60 ÷ 6



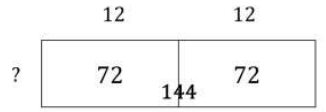
Using knowledge of factors to divide:

144 ÷ 24

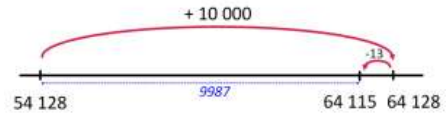


I know 2 and 12 are a factor pair of 24 and so I can divide by 2 and then by 12.

144 ÷ 2 ÷ 12



Addition



54 128 + 9987 = 54 128 + 10 000 – 13 = 64128 - 13

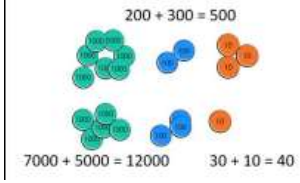
Pupils should realise that they can adjust first:

54128 + 9987 = 54128 – 13 + 10 000 = 54 115 + 10 000

Near doubles

Partition both numbers and combine the parts

7230 + 5310 = 12 000 + 500 + 40



Written column methods for addition:

	3	4	6	2	3
+		5	5	4	1
	4	0	1	6	4
	1	1			

Formal written method of long multiplication:

42 × 23

×	40	2
20	800	40
3	120	6

	H	T	O	
		4	2	
×		2	3	
	1	2	6	(42 × 3)
+	8	4	0	(42 × 20)
	9	6	6	

Multiplying a 3- or 4- digit number by a 2- digit number.

124 × 26

×	100	20	4
20	100 × 20 = 2,000	20 × 20 = 400	4 × 20 = 80
6	100 × 6 = 600	20 × 6 = 120	4 × 6 = 24

			1	2	4	
×				2	6	
			7	4	4	(124 × 6)
+	2	4	8	0		(124 × 20)
	3	2	2	4		(124 × 26)

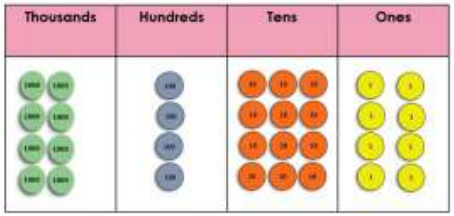
			2	1	
			6	4	2
x				2	7
		4	4	9	4
	1	2	8	4	0
	1	7	3	3	4
		1	1		

Cross out the ones once used e.g. cross out the 7 so they know they are now doing 642 x 20.

Sharing

Eight thousands shared into four equal groups
Five hundreds shared into ten tens
12 tens shared into four equal groups
Eight ones shared into four equal groups.

Grouping



Short division

Dividing a 4-digit number by 1-digit number:

8528 ÷ 4

	2	1	3	2
4	8	5	12	8

Long division

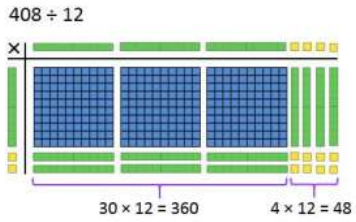
And with decimals:

	3	4	2	5	
	1	5	4		
+		6	3	6	2
	5	6	0	1	2
	1	1	1		

Regroup underneath for addition.

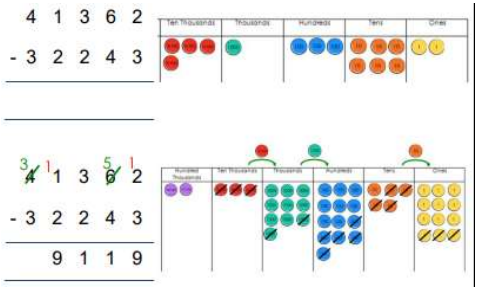
Dividing a 4-digit number by a 2-digit number:

$$
\begin{array}{r}
34 \\
12\overline{)\,408} \\
\underline{36} \\
48 \\
\underline{48} \\
0
\end{array}
$$



Year 6

Addition	Subtraction	Multiplication	Division

Written column methods:
 	
  3 4 6 2 3
+ 5 5 4 1
  4 0 1 6 4
  1 1
 	
With decimals:
 	
  3 4 . 2 5
  1 5 . 4
+ 6 . 3 6 2
  5 6 . 0 1 2
  1 1 1
 	
Carry underneath and **NOT** in between.
	Written column methods:
	
	4 1 3 6 2
	- 3 2 2 4 3
	
	 
	
		Long multiplication:
		
		  1 2
		  1 2 4
		X 2 6
		  7 4 4
		  2 4 8 0
		  3 2 2 4
		  1 1
		
		Carry on **TOP** for multiplication and **BOTTOM** for addition **NOT** in between.
			Short division:
			
			8528 ÷ 4
			
			  2 1 3 2
			4 8 5 1 2 8
			
			Long division:
			
			  3 4
			12 ⟌ 4 0 8
			  3 6
			  4 8
			  4 8
			  0
			
			12
			24
			36
			48
			60