Lakey Lane Primary School

Written Calculation Policy 2019-20

KS2 Written Calculation Policy

Addition

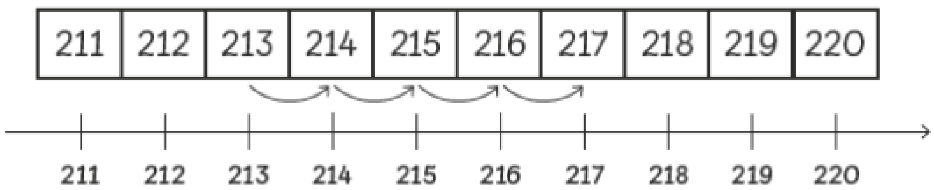
Year 3

Simple adding

When adding a three-digit number to ones, without renaming, children are to draw on methods taught in KS1: adding on a number line and partitioning the three-digit number to add the ones together and recombine.

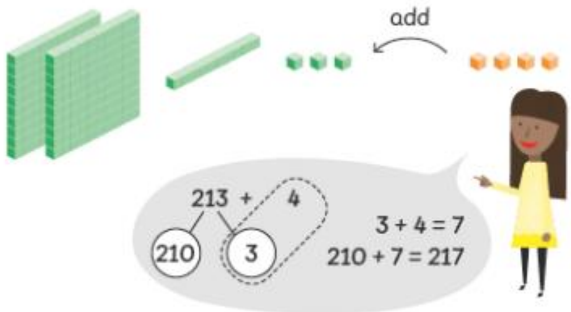
Add 213 and 4.

Method 1 Count on from 213.



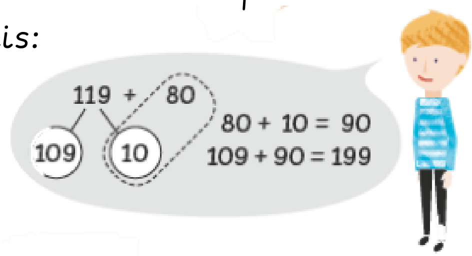
213 + 4 = 217

Method 2 Add the ones.



213 + 4 = 217

When adding a multiple of 10, without renaming, to a three-digit number, children are required to count on in tens or alternatively partition and recombine – similarly to method two above. Children would partition the number and add the tens and recombine. Like this:



This is exactly the same for adding a multiple of 100, without renaming, to a three-digit number.

When adding two three-digit numbers without regrouping, the formal method to use is column addition. This method is used alongside concrete resources such as base ten.

	h	t	o
	4	3	2
+	5	2	1
	9	5	3

Adding with renaming

Similarly to year 2, when adding with renaming, children are to use the formal method of column addition. Obviously in year 3, it develops from adding only two-digit numbers to adding three-digit numbers.

Initially it presents it slightly differently to straightforward column addition by making a jotting of the regrouped number – separating the hundreds, tens and ones and then recombining to find the answer and total each column at the end. Like this:

	h	t	o
	6	9	2
+		7	0
			2
	1	6	0
+	6	0	0
	7	6	2

By using this method alongside the base ten equipment, children can see what is actually happening to the numbers in the addition process step by step – securing their understanding.

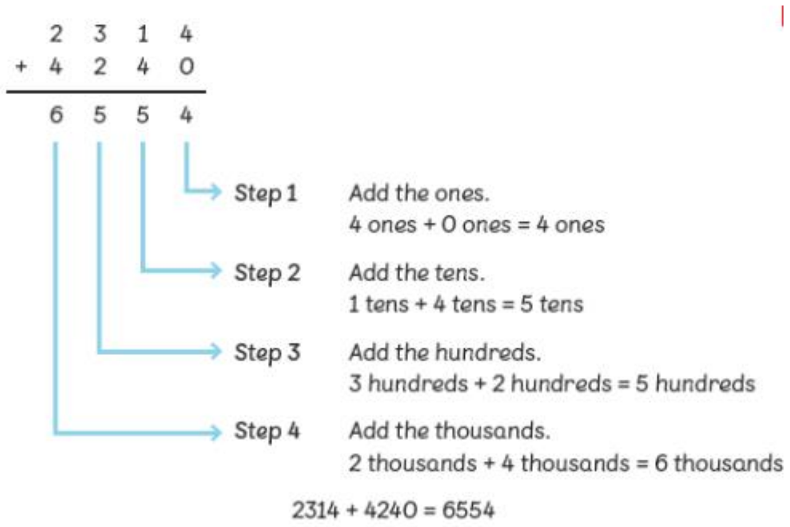
If children find this method a blocker, they can move directly onto the straightforward method of adjusting the necessary columns:

	h	t	o
	1		
	7	9	2
+		6	0
	8	5	2

<u>Year 4</u>

Adding within 10,000

Children are reminded of place value importance when using the formal method of column addition and correct digit placing. They are to begin adding four digit numbers without renaming.



Adding with renaming

Again, when renaming MNP advocates breaking down each digit and showing what they represent, then recombining. This could potentially help struggling learners to understand the process prior to moving onto straightforward column addition.

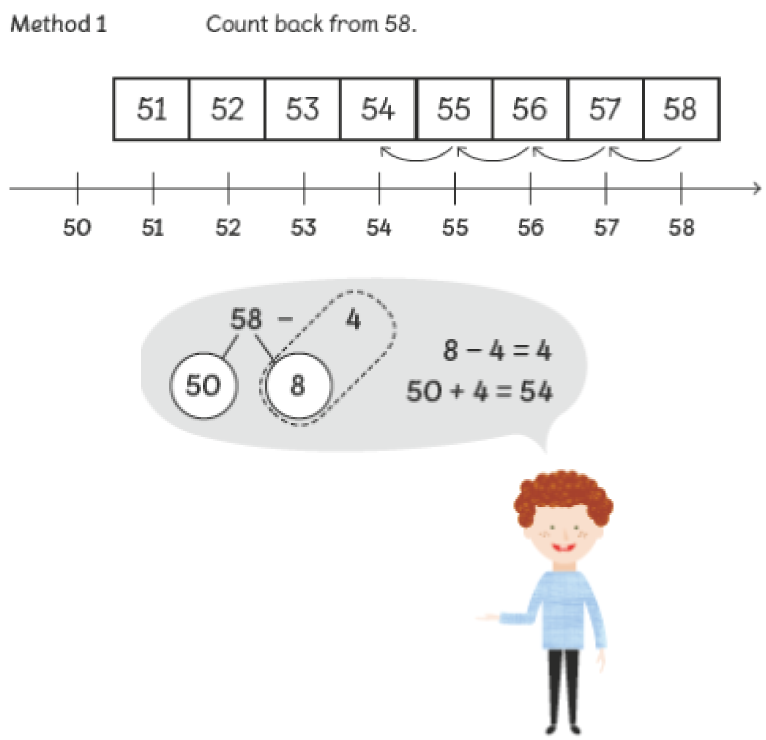
<u>Year 5</u> follows the same strategies but involves adding up to 1,000,000.

Subtraction

Year 3

Simple subtraction

Initially with simple subtraction, without renaming, children will draw on methods taught in KS1 such as counting backwards on a number line and partitioning a number and recombining once they have subtracted the hundreds from hundreds, tens from tens or ones from ones.



The number line, can be used to count back in tens or hundreds when subtracting a multiple of ten or a hundred.

Subtracting without renaming

Children will use straightforward column subtraction, without renaming, to subtract up to three-digits from three-digits.

	h	t	o
	9	7	5
−	7	2	3
	2	5	2

Subtraction with renaming

When subtracting, the clearest written method is straightforward columns and crossing out where renaming occurs. In MNP no alternative methods are provided. Due to addition being taught first, children should be familiar and confident using this method to add by the time they come to it in the subtraction chapter – giving them a helping hand.

	h	t	o
	8	2 $\cancel{3}$	11 $\cancel{1}$
–		2	6
	8	0	5

Year 4

Simple adding/adding without renaming

By the time children get to year 4, they are thought to no longer need to do alternative abstract methods such as drawing out a number line to count backwards. If they cannot draw on a mental strategy, they are to turn to the formal method of column subtraction.

	3	4	3	7
–	2	0	1	6
	1	4	2	1

Step 1 Subtract the ones.
7 ones – 6 ones = 1 one

Step 2 Subtract the tens.
3 tens – 1 ten = 2 tens

Step 3 Subtract the hundreds.
4 hundreds – 0 hundreds = 4 hundreds

Step 4 Subtract the thousands.
3 thousands – 2 thousands = 1 thousand

Subtraction with renaming

As in year 3, children use required to use column method and cross out when renaming to solve subtraction calculations.

$$
\begin{array}{rcccc}
 & & & 7 & 10 \\
 & 5 & 2 & \cancel{8} & \cancel{0} \\
- & 3 & 1 & 6 & 9 \\
\hline
 & 2 & 1 & 1 & 1 \\
\hline
\end{array}
$$

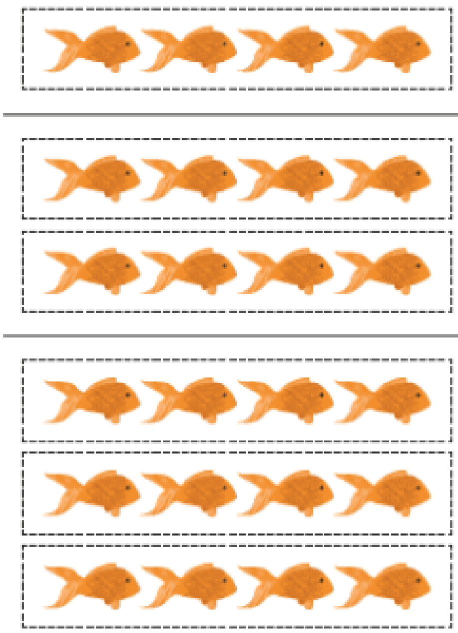
Year 5 follows the same strategies but involves subtracting within 1,000,000.

Multiplication

Year 3

In year 3, children are concentrating on recalling multiplication facts for the 3, 4 and 8 times tables – under the assumption that children are secure with their 2, 5 and 10 times tables from year 2.

Simply learning their times tables is expected however it is reinforced in MNP using pictorial arrays.



1 group of 4
$1 \times 4 = 4$

2 groups of 4
$2 \times 4 = 8$

3 groups of 4
$3 \times 4 = 12$

Multiplying a multiple of 10 by a one-digit number

When multiplying by a multiple of 10, children are to draw on their times tables knowledge (one digit x one digit) and are to then make their answer 10 times bigger.

E.g. 20 x 4 =

Use knowledge of 2 x 4 ->

$$
\begin{array}{cc}
 & \text{o} \\
 & 2 \\
\times & 4 \\
\hline
 & 8 \\
\hline
\end{array}
$$

Then using columns, make the answer 10x bigger ->

$$
\begin{array}{ccc}
 & \text{t} & \text{o} \\
 & 2 & 0 \\
\times & & 4 \\
\hline
 & 8 & 0 \\
\hline
\end{array}
$$

Multiplying a two-digit number by a one-digit number (without regrouping)

Using base ten and jottings, children are to multiply the ones by the one-digit number, the tens by the one-digit number and then recombine and add together the two answers.

This method is not essential, it is a step prior to the formal method to help children to understand each step, rather than learn a process.

For example: 12 x 4 =

Step 1 Multiply the ones by 4.

2 ones × 4 = 8 ones

Step 2 Multiply the tens by 4.

1 ten × 4 = 4 tens

Step 3 2 ones × 4 = 8
1 ten × 4 = 40
12 × 4 = 8 + 40 = 48

Once children are able to see what happens when you partition the two-digit number and multiply and recombine, they can progress to calculating using the formal long multiplication method.

Step 1 – multiply the ones

	t	o
	2	3
×		2
		6

Step 2 – multiply the tens

	t	o
	2	3
×		2
		6
	4	0

Step 3 – recombine and add together

	t	o
	2	3
×		2
		6
+	4	0
	4	6

Multiplying a two-digit number by a one-digit number (with regrouping)

The method for multiplying when regrouping is required is exactly the same. Children will just have to add together two two-digit numbers as shown:

	h	t	o
		2	5
×			4
		2	0
+		8	0
	1	0	0

Similarly to the development in the formal methods to add, children can progress to jottings of each multiplication product underneath the correct place value holder – as opposed to listing the product of multiplying the ones and then the tens.

Step 1

		t	o
		2	
		2	3
×			8
			4

Step 2

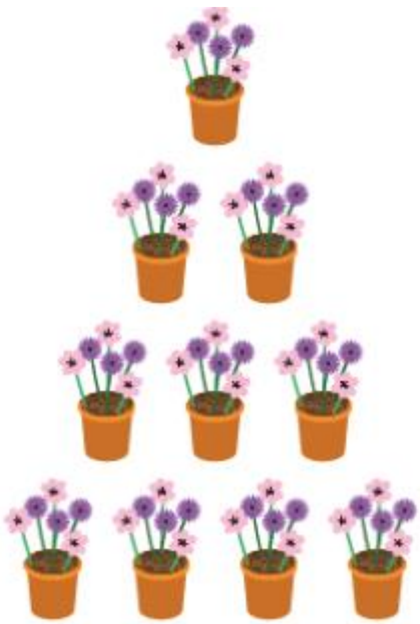
	h	t	o
		2	
		2	3
×			8
	1	8	4

$23 \times 8 = 184$

Year 4

In year 4, children are concentrating on recalling multiplication facts for the 6, 7, 9, 11 and 12 times tables – under the assumption that children are secure with their 2, 5 and 10 times tables from year 2 and their 3, 4 and 8 times tables from year 3.

Simply learning their times tables is expected however it is reinforced in MNP using pictorial arrays.



1 group of 6
$1 \times 6 = 6$

2 groups of 6
$2 \times 6 = 12$

3 groups of 6
$3 \times 6 = 18$

4 groups of 6
$4 \times 6 = 24$

There are 24 flowers altogether.

Multiplying two-digit numbers

Children are to use the same methods taught in year 3.

They can make jottings under place value columns for a shorter multiplication method or list each product and add them together for a longer multiplication method.

		1	
		2	3
×			6
	1	3	8

		2	3
×			6
		1	8
+	1	2	0
	1	3	8

Multiplying three-digit numbers

As multiplying by a two-digit number, the same methods are used for multiplying by a three-digit number.

		5	1	2	
×				8	
			1	6	multiply the ones
			8	0	multiply the tens
+	4	0	0	0	multiply the hundreds
	4	0	9	6	

		3	
	1	1	6
×			6
	6	9	6

Year 5

The same methods are taught in year 5 as in previous years to multiply by a one-digit number: short multiplication or long multiplication.

In year 5, the curriculum progresses to multiplying a four-digit number by a one-digit number.

Multiplying by 10, 100 and 1000

Children will multiply by 10, 100 and 1000 using their knowledge of place value and the digits moving either 1, 2 or 3 places to the left NOT adding zeros to the end of the number.

If necessary, MNP breaks this down uses counters and concrete objects. This is fairly straightforward and if place value understanding is secure, not essential.

Multiplying a two-digit number by a two-digit number

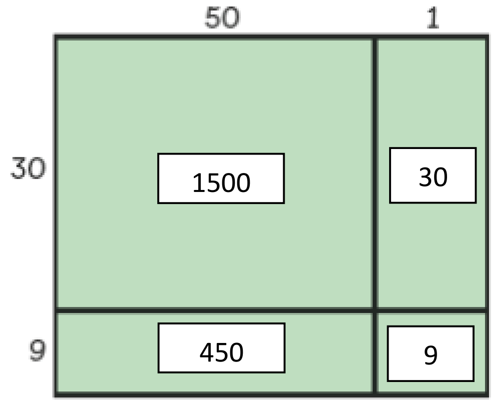
In order to multiply by a two-digit number, the number that children are multiplying by is partitioned into tens and ones. The number being multiplied is first multiplied by the ones and then the tens as shown below.

E.g. 14 x 12 =

$$\begin{array}{l} 14 \times 10 = 140 \\ 14 \times 2 = 28 \\ \hline 14 \times 12 = 168 \\ \hline \end{array}$$

Methods also used to multiply two-digit by two-digit are grid method…

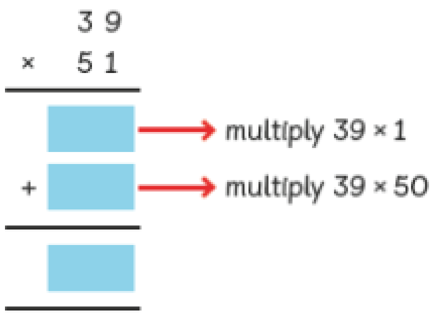
39 x 51 =



Then total each product to find the answer

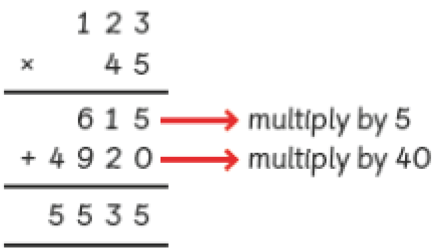
1500 + 450 + 30 + 9 = 1989

Alternatively they could use long multiplication…



Multiplying a three-digit number by a two-digit number

Grid method and column method are again the key strategies when multiplying a three-digit number by a two-digit number.



123 × 45 = 5535

	100	20	3
40	4000	800	120
5	500	100	15

4000 + 500 + 800 + 100 + 120 + 15 = 5535

The partitioning method can also be used.

E.g. 123 x 11 =

100 x 11 = 1100

20 x 11 = 220

3 x 11 = 33

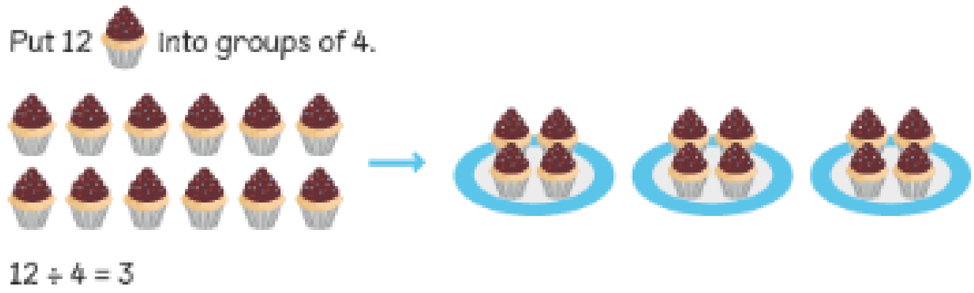
1100 + 220 + 33 = 1353

Division

Year 3

Dividing by 3, 4 and 8

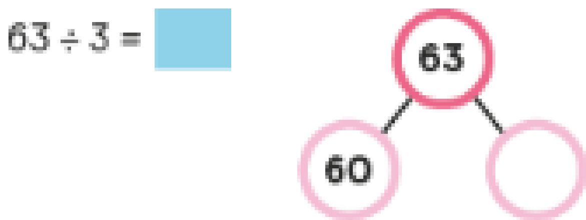
The division curriculum in KS2 begins with the physical sorting of amounts into 3's, 4's and 8's. The presentation of the division of these numbers within MNP uses pictures and a 'sharing out' method – it is more jottings alongside concrete and pictorial representations.



Simple dividing

When dividing a two-digit number by a one digit number, MNP advocates partitioning the two-digit number first of all using the 'part part whole diagram'. The two numbers that partition the number into must both be divisible by the divisor.

E.g.



Here the number 60 has been given which is divisible by 3, as will the other 'part'. 3 is also divisible by 3.

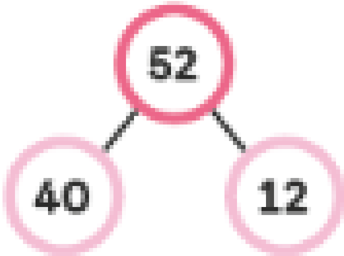
Once the two numbers have been partitioned and divided by the divisor, the answers are recombined.

For example: 60 ÷ 3 = 20 and 3 ÷ 3 = 1

20 + 1 = 21

Dividing with regrouping

When dividing a two-digit number by a one-digit number with regrouping, the number partitioning is not as straight forward. Instead of simply partitioning the tens and the ones, the children must identify two numbers that make up the whole that are both divisible by the divisor.



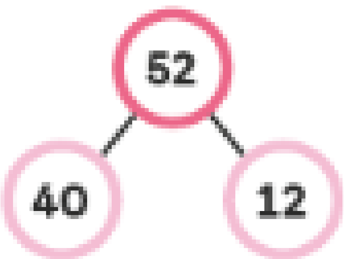
For example, 52 ÷ 4 could be partitioned like this…

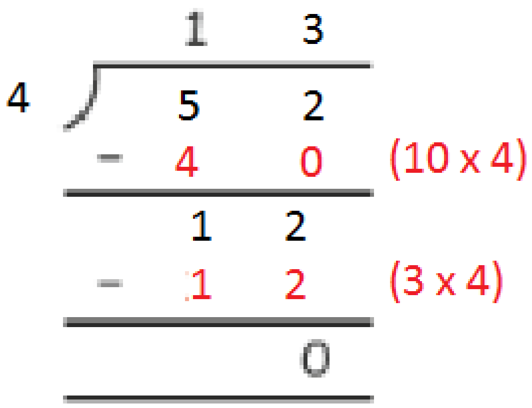
40 ÷ 4 = 10 and 12 ÷ 4 = 3

10 + 3 = 13

52 ÷ 4 = 13

This method can then progress to the formal written method of long division (chunking).





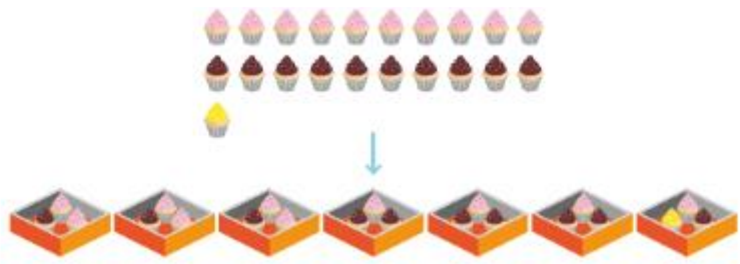
Year 4

Methods taught in year 4 are the same as those in year 3 with larger numbers and extending to dividing with remainders.

Dividing by 6, 7, 9, 11 and 12

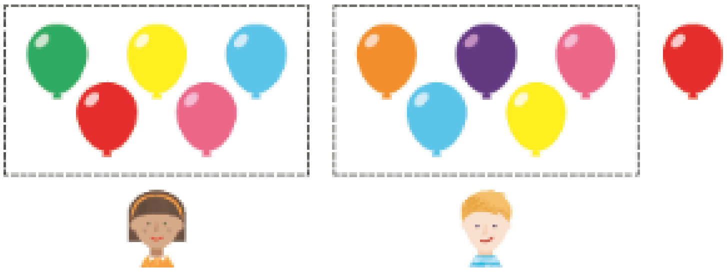
The division curriculum in year 4 begins with the physical sorting of amounts into 6's, 7's and 9's. The presentation of the division of these numbers within MNP uses pictures and a 'sharing out' method – it is more jottings alongside concrete and pictorial representations.

E.g. 21 ÷ 7 = 3



Dividing with remainders

Initially when dividing with remainders, children are to use concrete and pictorial representations to physically share out an amount by the divisor and see how many are left over.



11 ÷ 2 = 5 remainder 1

Year 5

Dividing by 10, 100 and 1000

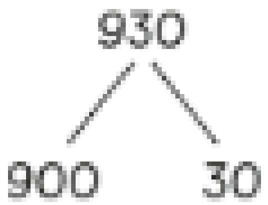
Children will divide by 10, 100 and 1000 using their knowledge of place value and the digits moving either 1, 2 or 3 places to the right NOT removing zeros from the end of the number.

If necessary, MNP breaks this down uses counters and concrete objects. This is fairly straightforward and if place value understanding is secure, not essential.

Dividing three and four-digit numbers by a one-digit number

As in previous year groups, children will begin by partitioning the number into hundreds, tens and ones for example, using the 'part part whole' diagram. This makes dividing easier where regrouping is not required.

$$930 \div 3 = \boxed{}$$



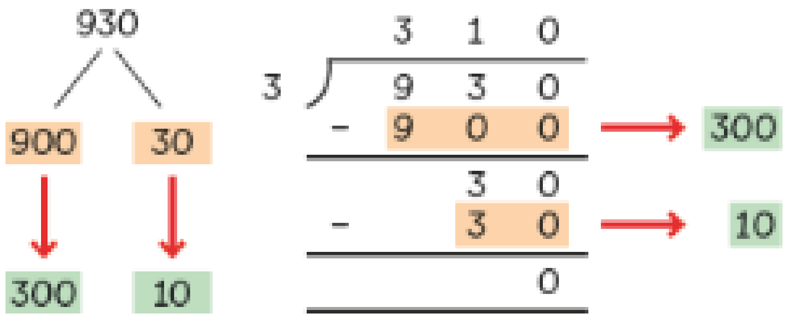
$$900 \div 3 = 300$$

$$30 \div 3 = 10$$

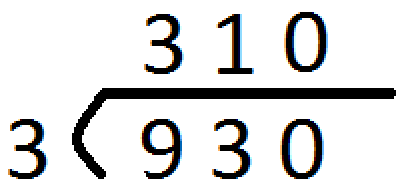
$$300 + 10 = 310$$

However, although possible, this is trickier when regrouping is required due to having to partition the large number into parts that are all multiples of the divisor.

This is when it is advised to move to the formal method of long division (chunking) or bus stop method.

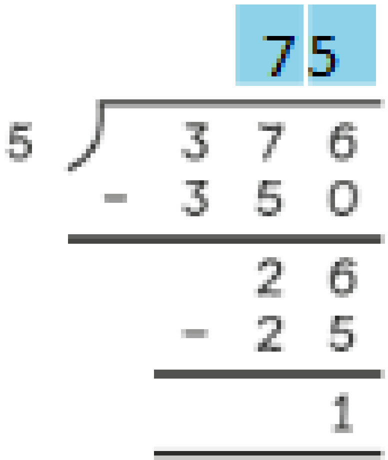


When dividing by a one digit number, straightforward bus stop method is advised.



Dividing with a remainder

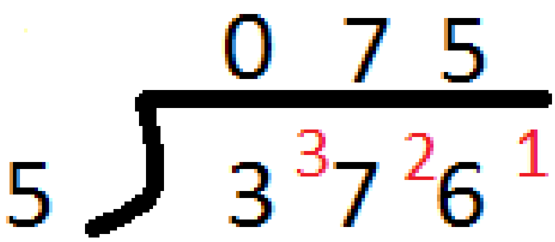
When there is a remainder, the previously taught methods can also be used like so…



5 x 70

5 x 5

76 ÷ 5 = 75 remainder 1



In year 6, the preferred method for dividing by a one-digit number is short division (bus stop method) and for dividing by a two-digit number the preferred method is long division (chunking).