Preston Hedge's Primary School

Calculation Policy

This calculation policy has been written in response to the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Early learning in number and calculation in Reception follows the Development Matters EYFS documentation and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Non-negotiable written method table

Year Group	Addition	Subtraction	Multiplication	Division
1	Pictorial representations and Number lines	Pictorial Representations	Pictorial Representations and Arrays	Pictorial Grouping
2	Number Lines and (Expanded) Column Method	Number Lines	Repeated Addition and Grid Method	Number Line
3	Column Addition (Carrying)	T – Method and Decomposition	Short Multiplication	Number Line (jumping in multiples x10, x5, x2) and Bus stop
4	Column Addition	Decomposition	Short Multiplication	Bus Stop
5	Column Addition	Decomposition	Short Multiplication	Bus Stop and Long Division
6	Column Addition	Decomposition	Short Multiplication	Long Division and Factorising

Key Stage 1

Key Stage 1

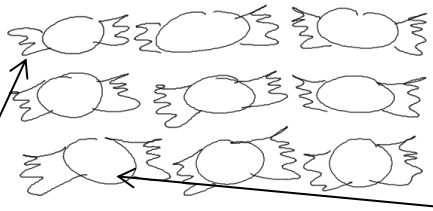
Addition

Initially pictures will be used to solve problems with addition. Children will count totals starting at the number one and later starting on the highest number and counting up.

Example: If I had 6 sweets and then got 3 more how many would I have in total?

Children will begin by using one-to-one correspondence to count totals of numbers.

1, 2, 3, 4, 5, 6, 7, 8, 9 (pointing to each object as they count.



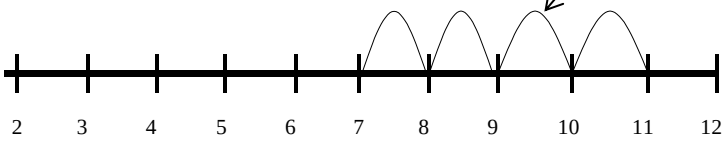
As children become more confident with addition and counting they will begin at the larger number and count the remaining steps.

7, 8, 9.

This will progress onto children using a number line to count up from one number to another.

Example: 7 + 4 =

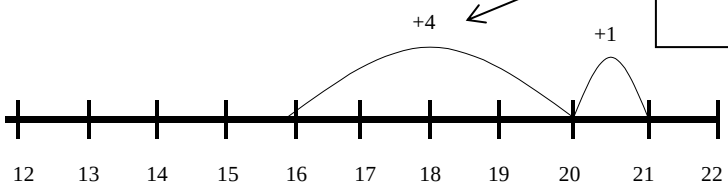
Starting on the larger number and counting the remaining steps (represented as 'jumps').



As children become more confident with number bonds and partitioning of numbers larger jumps can be made.

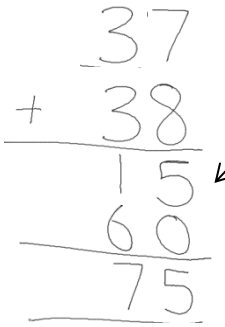
Example: 16 + 5 =

Knowledge of number bonds to 20 has been used (adding 4) then knowledge of partitioning (5 is made up of 4 and 1).



When children begin to add larger numbers they will require a more refined and faster method. Expanded column addition allows children to add larger numbers whilst still retaining place value.

Example: **37 + 38**



Units are added first (7 + 8 = 15) and recorded in correct columns. The tens are then added (30 + 30 = 60) and again recorded in columns. Finally the sum of the units and tens are added together.

Once children have a secure understanding of the place value system they can begin to look at using the formal written method (column addition) with carrying. This allows additions to be carried out far quicker without the need for partitioned additions.

Example:

789 + 642 becomes

	7	**8**	**9**
+	**6**	**4**	**2**
1	**4**	**3**	**1**
	1	1	

Answer: 1431

Digits are lined up in columns linked to their place value (HTU).

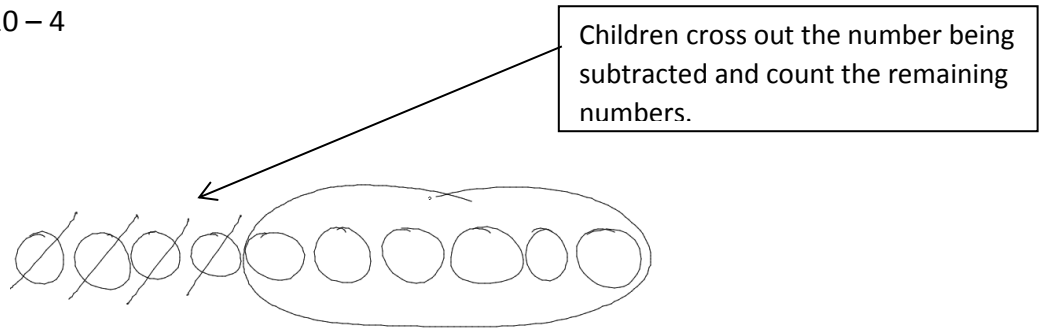
Addition of 9 + 2 equals 11. The first digit (one) is carried forwards underneath the equation to be added onto the addition if the next set of numbers.

Key Stage 1

Subtraction

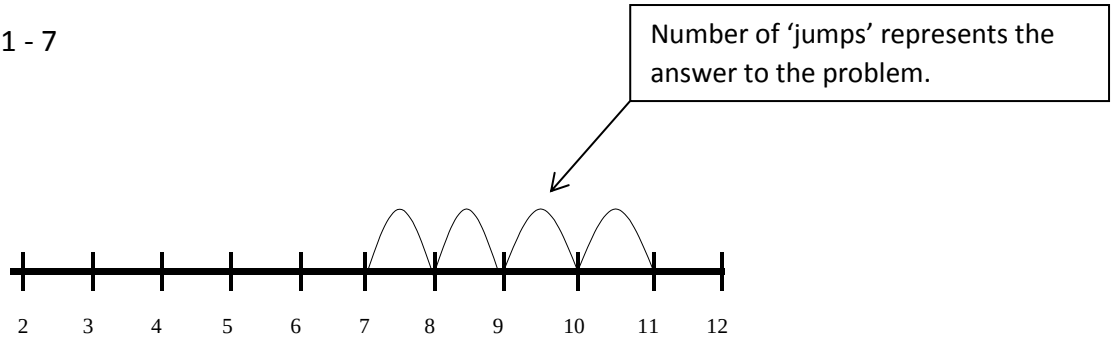
Similarly to addition children will begin to tackle subtraction problems using pictorial representations which they can manipulate to find the answer.

Example: 10 – 4

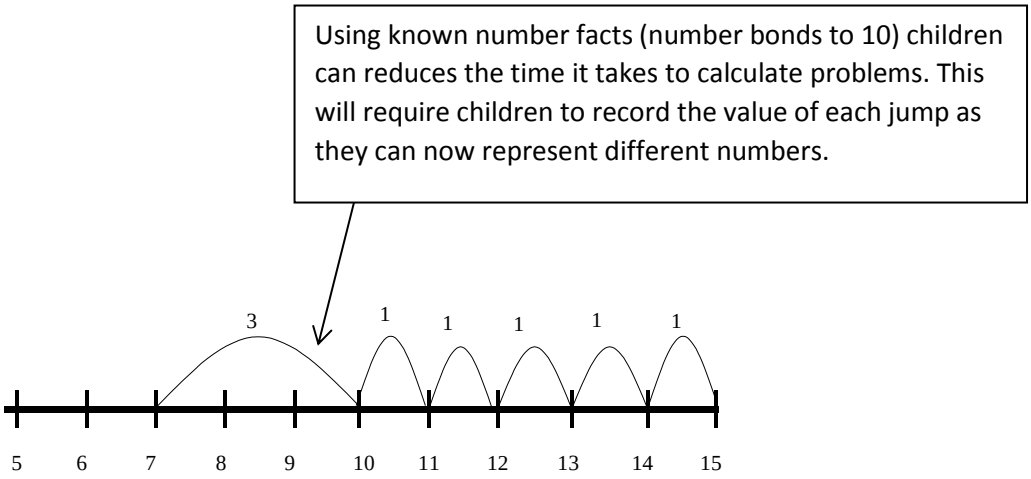


This will develop on to children using a number line to represent. Children will count up from the smaller digit to the larger digit in jumps of one.

Example: 11 - 7

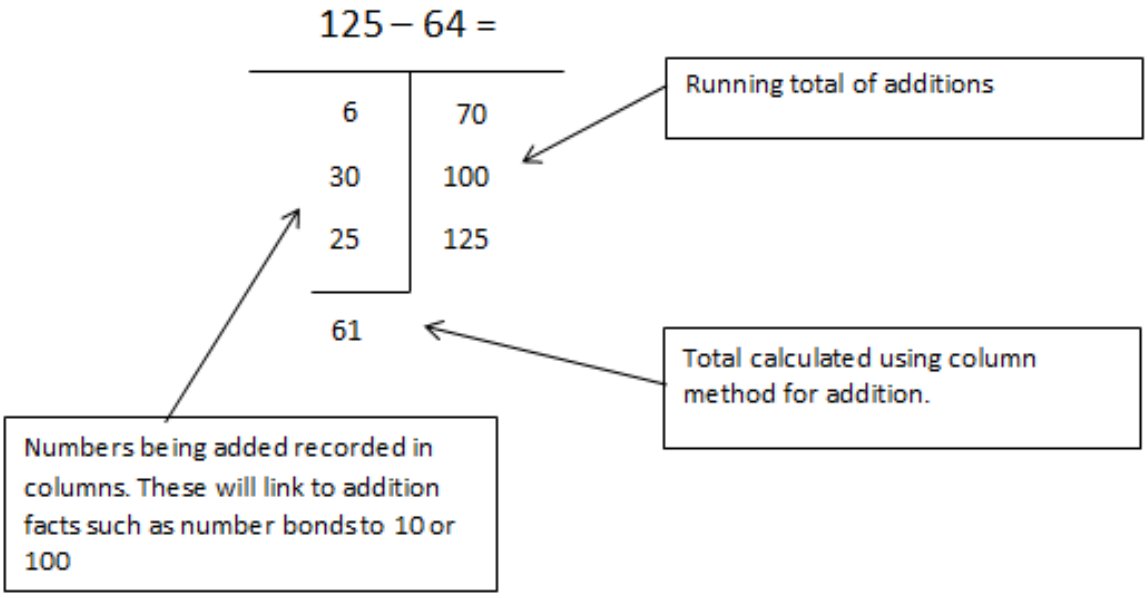


Example: 15 - 7



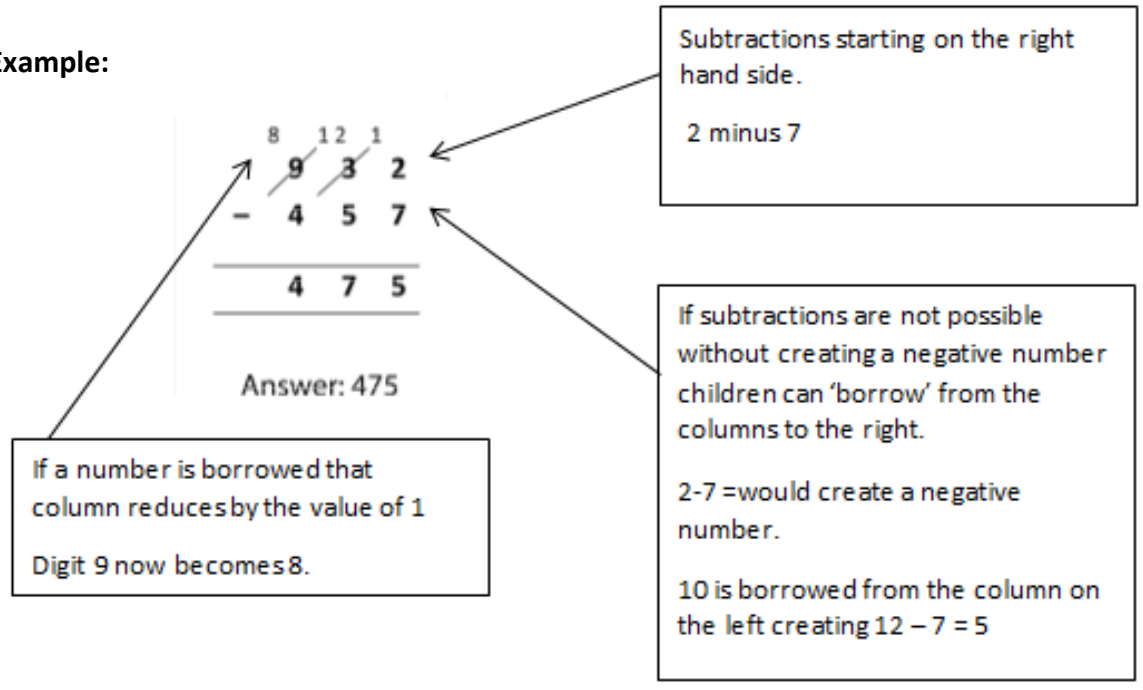
This links smoothly into T method for subtraction and allows children to build up or count on using addition facts they will have secured during mental maths sessions.

Example:



Children will progress onto using decomposition for subtractions. Like column addition operations are set out into in place value columns.

Example:

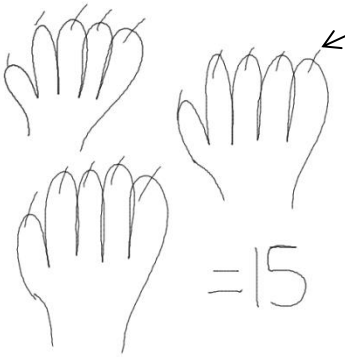


Key Stage 1

Multiplication

Multiplication begins with children practically grouping and counting sets of objects in sets of ones, twos or fives. This will progress onto pictorial representations of problems.

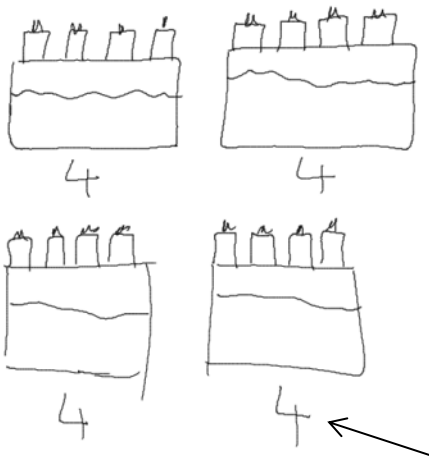
Example: One hand has 5 fingers, how many fingers are on 3 hands altogether?



As the children count the number they can cross off what they have counted.

Eventually children will record numbers alongside their representations.

Example: One cake has 4 candles on it, how many candles would 4 cakes have altogether?

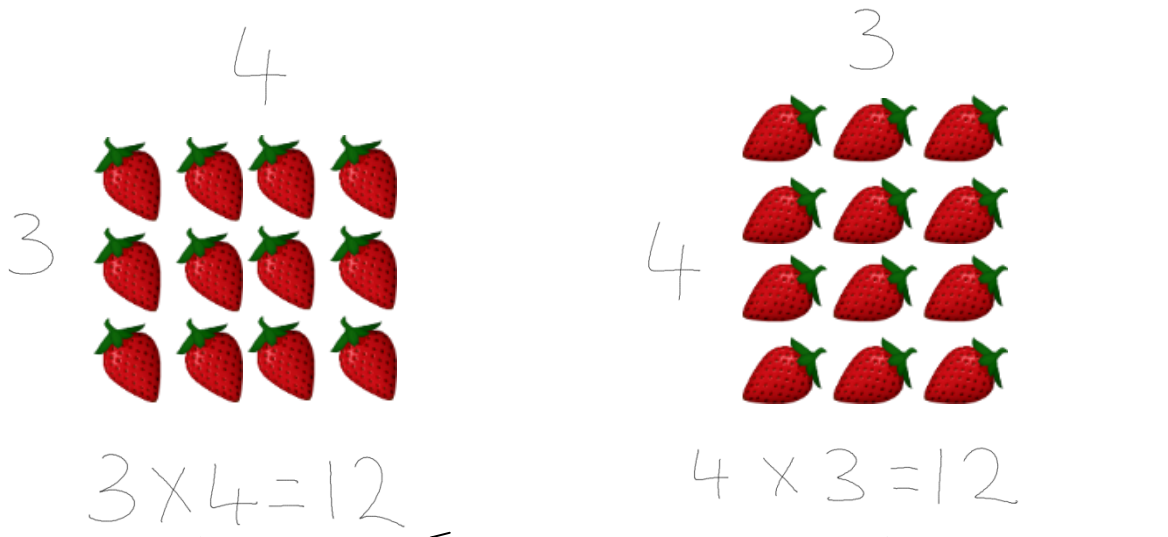


With numbers under each representation children can begin to see the idea of repeated addition.

4 + 4 + 4 + 4

The next stage is for children to record problems as arrays.

Example: You get 4 strawberries in 1 packet, how many are in 3 packets in total?



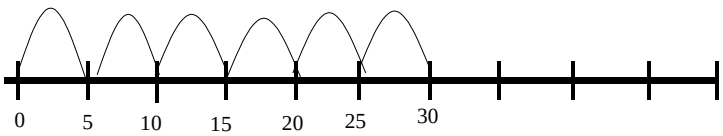
Operations can be recorded underneath the array representations.

This also allows children to see the commutative nature of multiplications.

3 x 4 is the same as 4 x 3

Moving on from this, children will record equations on a number line jumping in multiples.

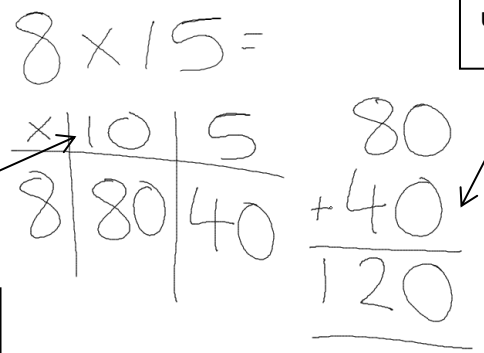
Example: 6 x 5



Having learnt the commutative nature of multiplication children can choose which multiples to jump in. Here 5 is an easier times table to count in rather than 6.

Grid method introduces a process that allows larger numbers to be multiplied more efficiently.

Example:



After the multiplications have been carried out, column addition can be used to find the answer.

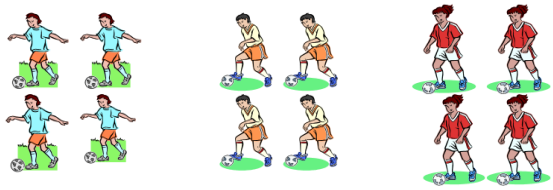
It is important children understand the value of the digit 1 as 10 in the number 15.

Key Stage 1

Division

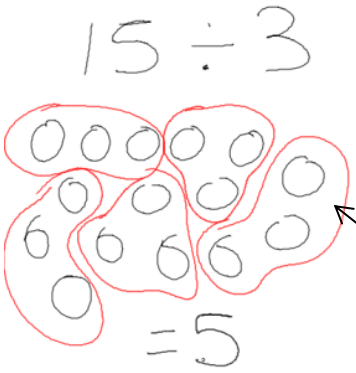
Division will begin with children physically dividing (sharing) objects into equal groups.

Example: There are 12 football players and 3 teams, if you share the football players out equally, how many players will there be on each team?



Early recordings will be pictorial representations that the children can divide by circling groups.

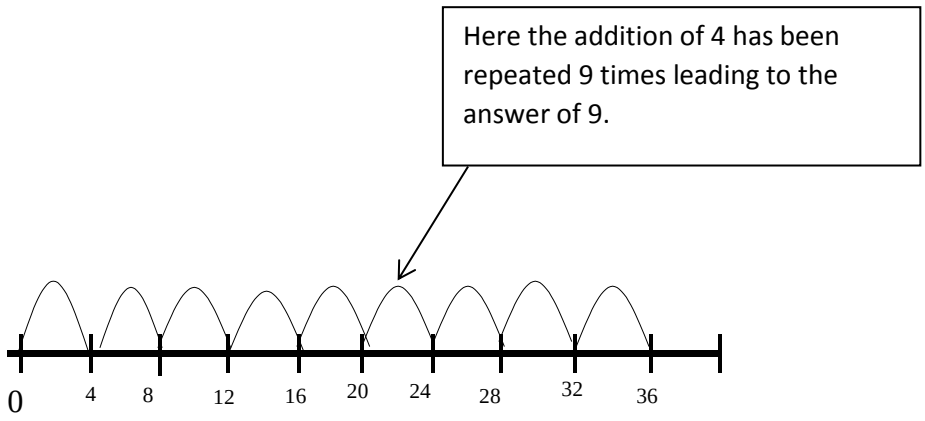
Example: There are 15 children working in groups of 3. How many groups are there going to be?



This differs from the previous physical representation as children are now grouping into 3s rather than sharing.

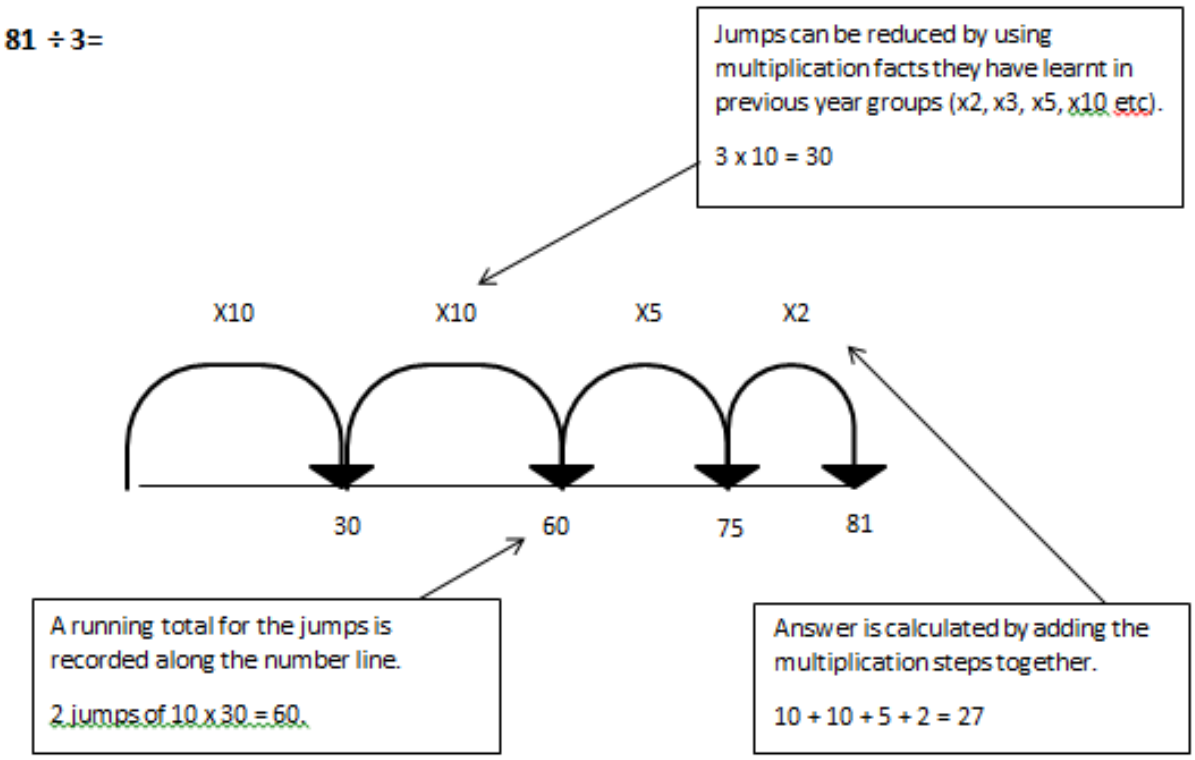
Children will eventually solve problems using a number line and repeated addition.

Example: 36 ÷ 4



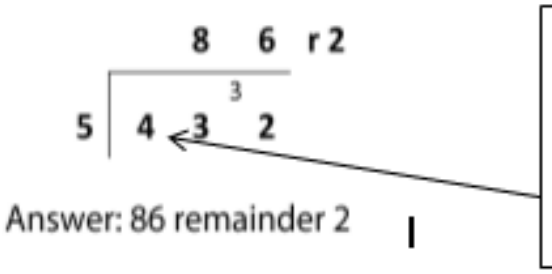
As children become more confident with repeated addition and multiplication tables they can progress onto jumping in multiples on the number line.

Example:



The final step for division is short method (bus stop method)

$432 \div 5$ becomes



Answer: 86 remainder 2

It is important the children understand the number being divided by (divisor). This can sometimes be reversed if the times table does not 'fit'

Eg 5's in 4 = 0

Not 4's in 5

Key Stage 2

Key Stage 2

Addition

In Key Stage 2 children will move towards a standard formal written method of addition (column method). Calculations will be recorded with each digit in place value order vertically. Calculations beginning on the right, carrying forward any additions that create a 2 digit answer.

789 + 642 becomes

Digits are lined up in columns linked to their place value (HTU).

```
   7  8  9
+  6  4  2
-----------
1  4  3  1
-----------
   1  1
```

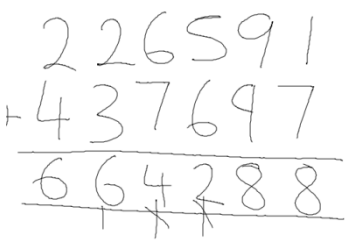
Addition of 9 + 2 equals 11. The first digit (one) is carried forwards underneath the equation to be added onto the addition if the next set of numbers.

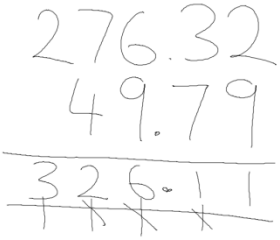
Answer: 1431

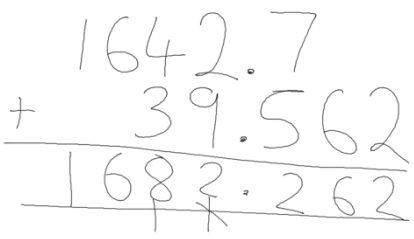
Extension and Progression.

With a consolidated method in addition children will be extended through number of digits, decimal number and numbers of varied length.

Examples:



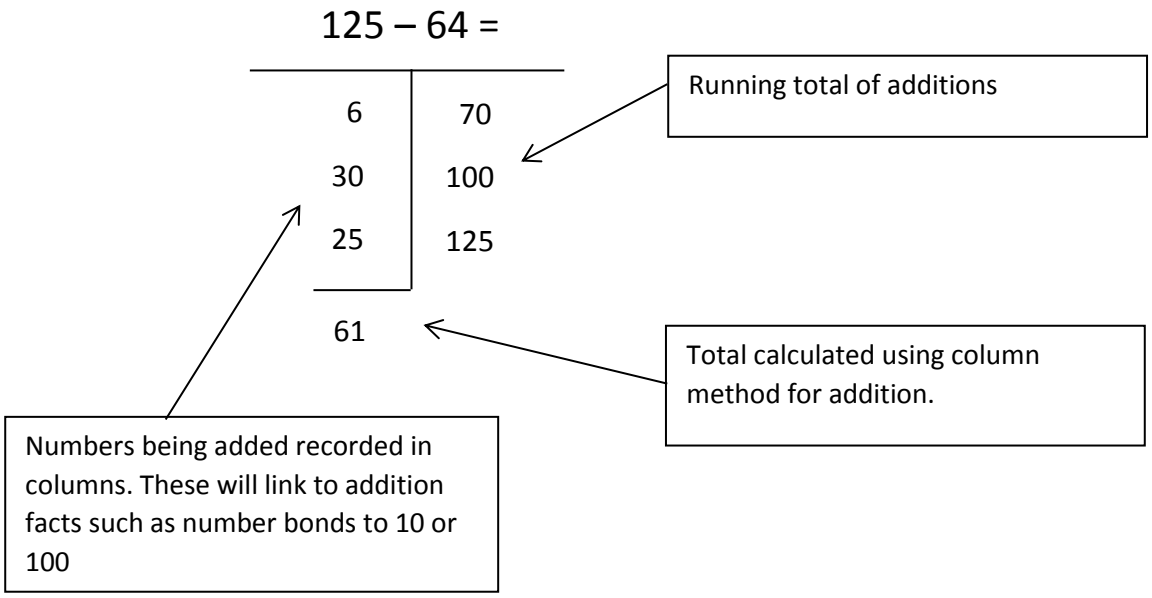




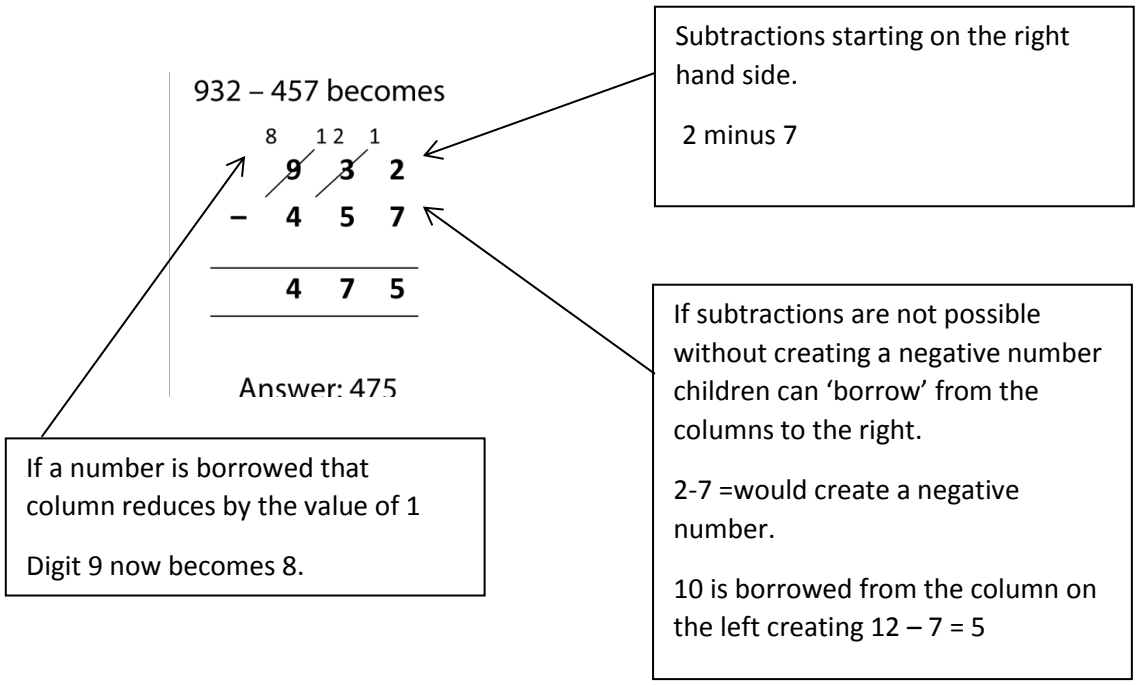
Key Stage 2

Subtraction

Entering into Key Stage 2 children will learn the T method for subtraction. This progresses on from number line and allows children to build up or count on using addition facts they will have secured during mental maths sessions.



Children will progress onto using decomposition for subtractions. Like column addition operations are set out into in place value columns.

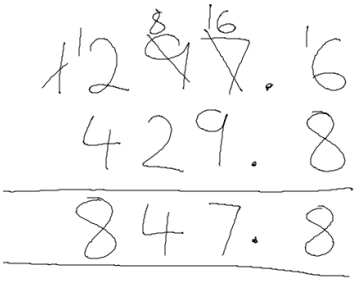


Extension and Progression

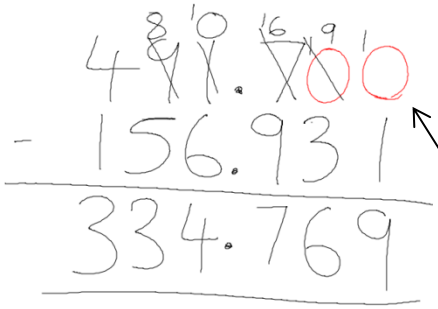
Once children have consolidated the formal written method of decomposition they will be extended through number of digits and decimal numbers.

Examples:

1297.6 – 429.8



491.7-156.931



0's added to the hths and thths as place holders to keep the numbers the same length and remind children of the equation

0 - 1

Key Stage 2

Multiplication

Throughout Key Stage 2 children will refine their understanding of multiplication through the formal written method of short of multiplication.

2741 × 6 becomes

	2	7	4	1
×				6
1	6	4	4	6
	4	2		

Answer: 16 446

124 × 26 becomes

	1	2	
	1	2	4
×		2	6
	7	4	4
2	4	8	0
3	2	2	4
1	1		

Answer: 3224

Children need to understand the carrying of forward of products that give a 2 digit answer.

6 x 4 = 24

The 2 carries forward to the next column and is added to the next answer

When multiplying by a number with a tens value children need to be aware of place value

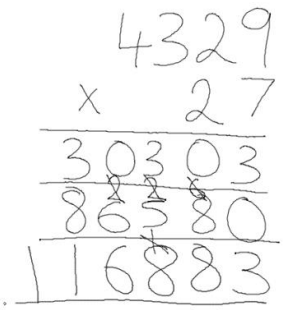
20 x 4 not 2x4

0 is used as a place holder to ensure the columns are aligned

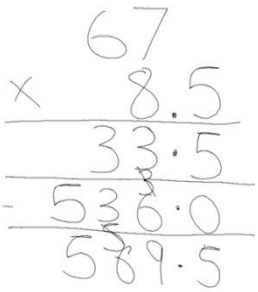
Extension and Progression.

To further challenge the children they can begin to look at more digits or decimals numbers.

Examples: 4329 x 27



67 x 8.5



Key Stage 2

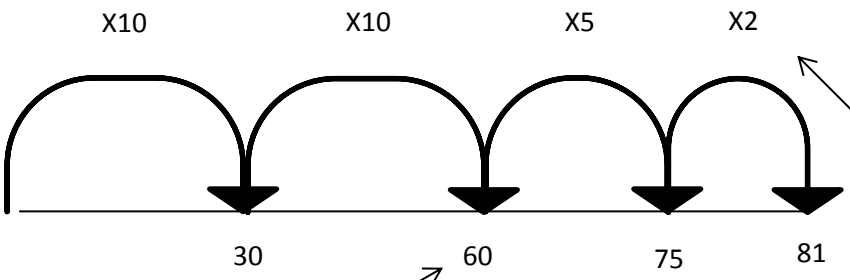
Division

As the children enter Key Stage 2 they will consolidate their understanding of division using a number line and repeated addition with known multiplication tables.

81 ÷ 3=

Jumps can be reduced by using multiplication facts they have learnt in previous year groups (x2, x3, x5, x10 etc).

3 x 10 = 30



A running total for the jumps is recorded along the number line.

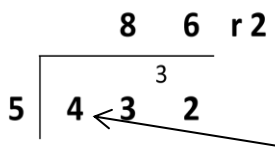
2 jumps of 10 x 30 = 60.

Answer is calculated by adding the multiplication steps together.

10 + 10 + 5 + 2 = 27

The final step for division is short method (bus stop method)

432 ÷ 5 becomes



Answer: 86 remainder 2

It is important the children understand the number being divided by (divisor). This can sometimes be reversed if the times table does not 'fit'

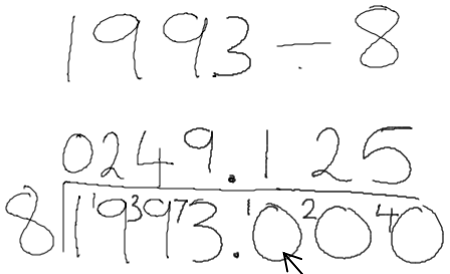
Eg 5's in 4 = 0

Not 4's in 5

Extension and Progression

Once the children to have consolidated short division they can be extended by recording their remainders as decimal numbers and factorising larger divisors.

Examples:



Here the remainder of 1 has been divided into by 8 creating a decimal rather than representing the remainder as r1 or ⅛. 0 is used as a place holder to allow the remainder to be carried over.

Factorising allows children to use larger divisors that they may not have the times table knowledge of. Here 15 is split into the factor pair of 5 and 3. The number 2460 is divided by 5 then the answer by three effectively dividing it by 15.