BAILEY GREEN PRIMARY SCHOOL

PROGRESSION IN CALCULATION

This booklet has been produced to outline the calculation strategies we use at Bailey Green. They are based on The National Curriculum for Mathematics guidelines and are progressive, but not 'exhaustive'. We hope this booklet will assist you in supporting your child in their learning in Mathematics.

There are 5 specific 'keys' with which you can support at home:

- Knowing number bonds to 10 and 100.
- Learning multiplication tables.*
- Understanding the value of each digit in a number.
- Understanding Mathematical language.
- Applying understanding to problems.

*More information about the age-related expectations for multiplication tables is under the 'multiplication' section of this booklet.

Early Years and Foundation Stage

In Nursery and Reception, and the beginning of Year 1, the emphasis is very much on practical mathematical opportunities such as:

- Counting objects & doubling numbers
- Sorting, recognising and naming shapes
- Comparing sizes
- Role play opportunities involving numbers, counting numbers and money

The use practical objects, rhymes, songs and story-telling are central to the teaching and learning of mathematics in the Early Years. Children will also learn how to form their numbers correctly, and begin to write some simple number sentences.
For more information about Early Years outcomes relating to Mathematics, you can access the document 'What to expect in the Early Years Foundation Stage: a guide for parents' at: https://foundationyears.org.uk/wp-content/uploads/2021/09/What-to-expect-in-the-EYFS-complete-FINAL-16.09-compressed.pdf

As the children move into Key Stage 1 (Year 1 & 2), they are introduced gradually to more formal recording of the 4 operations of number:

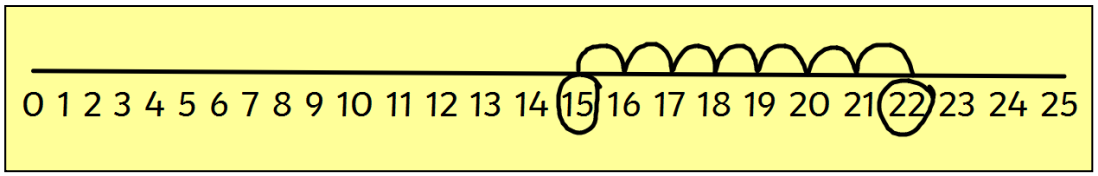
- Addition
- Subtraction
- Multiplication
- Division

ADDITION

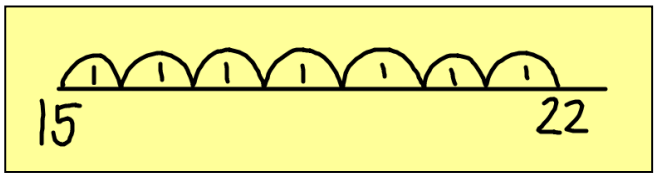
Addition in Key Stage 1 (Year 1-2)

Children are introduced to number lines and will record using + and =.
E.g. 15 + 7 = 22

We begin with largest number, 15, and then count on 7 more in 1's.

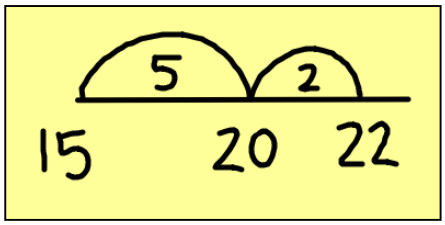


More confident children will be introduced to blank number lines.

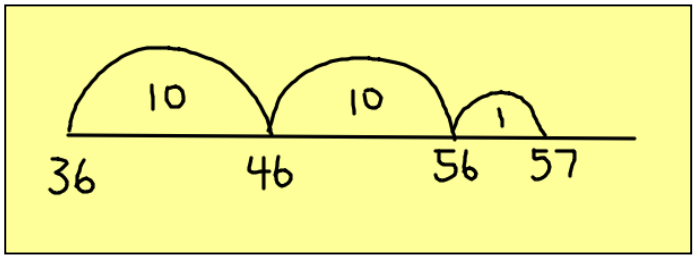


Children spend extended time on place value in KS1 to ensure they understand how and why numbers are partitioned. As children become more confident with counting in 2's, 5's and 10's, we make larger jumps.

We begin with the largest number, 15, jump to the nearest whole 10 by adding on 5, and then add on the 2.



Children will add 2 digit numbers using the same method (always starting with the biggest number), adding the tens and ones separately:
E.g. 36 + 21 = 57



As children become more confident they learn to add by partitioning (splitting the numbers).

E.g. 21 + 36 = 57

Partition the 21 into	20	and	1		
Partition the 36 into	30	and	6		
Add the tens	20	+	30	=	50
Add the ones	1	+	6	=	7
Add the tens and ones	50	+	7	=	57

They will use this method for 2 and 3 digit numbers.

Addition in Key Stage 2 (Year 3-6)

Children continue to partition with 3 digit numbers up to 1000.

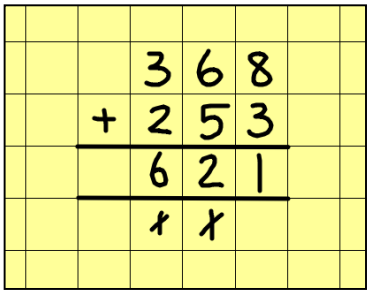
E.g. 432 + 225 = 657

400	+	200	= 600
30	+	20	= 50
2	+	5	= 7

The column method for addition will be introduced in KS2 as soon as children are confident and secure in their knowledge of place value. Children must understand that they are adding 2 ones and 5 ones, 3 tens and 2 tens, and 4 hundreds and 2 hundreds, etc. We manage this transition using place value counters, and allow the children time to use practical activities to solidify their understanding.

As the children move through KS2, column addition is consolidated:

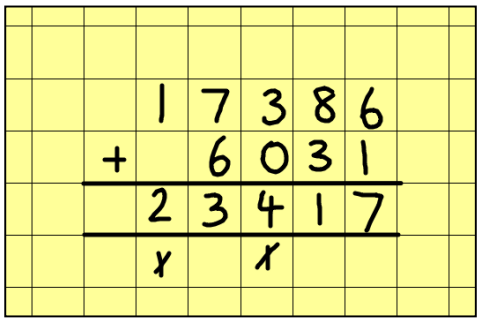
E.g. 368 + 253 = 621



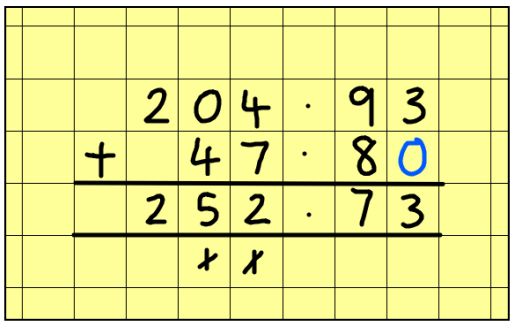
It is important that 'carried' digits are written below the line, in the correct column, and crossed out to show they have been added on.

This method is also used when the children are adding much larger numbers and numbers with decimals:

E.g. 17,386 + 6031 = 23,417



E.g. 204.93 + 47.8 = 252.73



It is crucial that the digits and decimal point are placed in the correct column. The children will be encouraged to write their decimals points in line first to support their place value layout. In the example above, a 0 has been written after the 8 in order to provide a layout which will be clearer for some children.

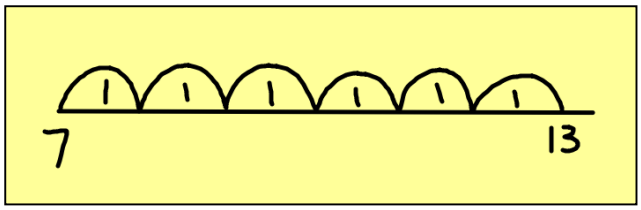
SUBTRACTION

Subtraction in Key Stage 1 (Year 1-2)

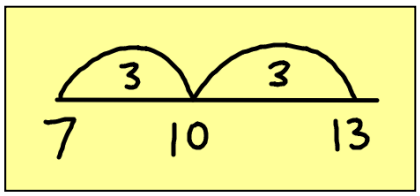
Children will spend extended time in Year 1 working with concrete objects and the language around subtraction. They are then introduced to number lines and will record using - and =.

They will use a blank number line to find the difference, starting at the smallest number and counting on to the largest:

E.g. 13 - 7 = 6

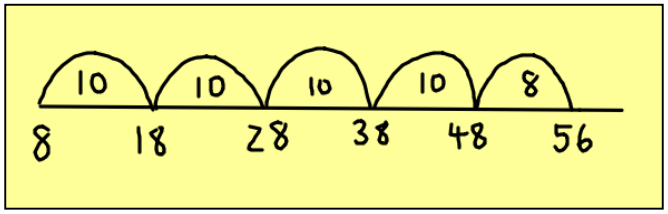


Children will continue this method, making larger jumps as they become more secure:



As the children become more confident, the jumps can be bigger still:

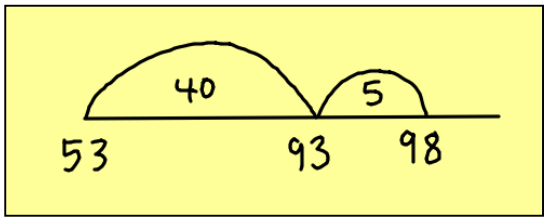
E.g. 56 - 8 = 48



Subtraction in Key Stage 2 (Year 3-6)

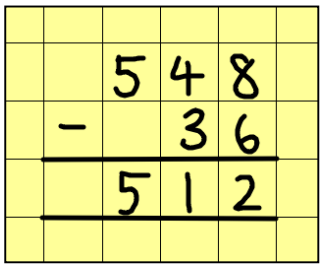
Number lines will continue to be used in the early months of Key Stage 2, with larger numbers and bigger jumps:

E.g. 98 - 53 = 45



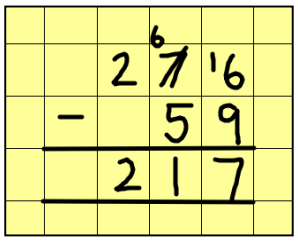
Column subtraction is introduced to the children as an efficient method, initially with all top line digits all being larger than bottom line:

E.g. 548 - 36 = 512



As children progress through KS2, they will be taught decomposition, using two-digit numbers initially, moving onto larger numbers. Again, children are supported in the transition to column methods using place value counters.

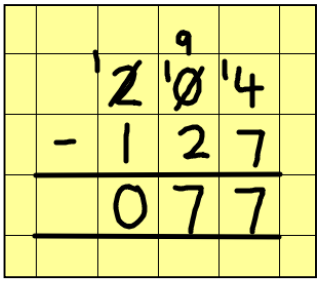
E.g. 276 - 59 = 217



In this example, it is not possible to subtract 9 from 6, so we go to the next column and exchange (not borrow!) 1 ten, leaving 6 tens. The 1 ten is transferred to the ones column and exchanged for 10 ones, making a total of 16 ones.

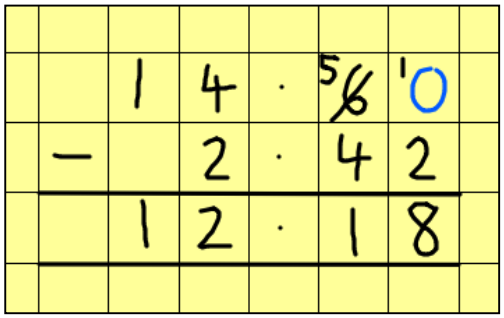
The children are taught how to exchange from one column to the next when 0 is one of the digits:

E.g. 204 - 127 = 77



In this example, it is not possible to subtract 7 from 4, and there are no tens available to exchange in the next column. In this scenario, the children are taught to exchange twice: exchange 1 hundred for 10 tens, and then exchange 1 of those tens for 10 ones.

This method is used to subtract large numbers and decimals.



Similar to addition, it is crucial that the digits and decimal point are placed in the correct column. In this example, a 0 has been written after the 6 - this **must** be done for the children to calculate accurately with decimal Subtraction.

MULTIPLICATION

It is vital that the children learn their times table to support their mental and written calculations. We continually work on this in school, but support from home can make a tremendous difference.

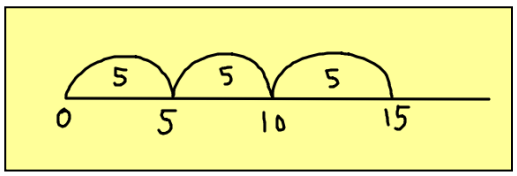
From Year 2 onwards, the children will have access to the 'Times Table Rockstars' programme (available online at: https://ttrockstars.com/). The children will regularly access this in school, and this can be accessed at home too!

Multiplication in Key Stage 1 (Year 1-2)

Children count in multiples of 2, 3, 5 and 10 and double numbers.
Children are introduced to pictorial arrays (pictures of object set up in rows/lines), and begin to record formally using x and =.
E.g. 4 x 3 = 12

Multiplication is equated to repeated addition: 4 x 3 = 3 + 3 + 3 + 3 = 12
They also need to know that the answer is exactly the same when the calculation is reversed: 3 x 4 = 4 + 4 + 4 = 12

Number lines are linked to x2, x3, x5 and x10:
E.g. 3 x 5 = 15



Multiplication in Key Stage 2 (Year 3-6)

Children are expected to know their times tables and related division facts fluently. They should already know their x2, x3, x5 and x10 by the end of Key Stage 1, but this will be consolidated in Key Stage 2. By the end of Year 3, children will learn their x4, x6, x8 and x9 and begin to explore x7. In Year 4, children will continue to work x7 and move on to x11 and x12 and consolidate all other multiplication tables. In Year 5 and 6, children will continue to consolidate and apply their multiplication knowledge.

Statutory Multiplication Tables Check (MTC)

From the 2019/20 academic year onwards, all schools in England are required to administer an online multiplication tables check (MTC) to year 4 pupils. The purpose of the MTC is to determine whether pupils can recall their times tables fluently, and it will help schools to identify pupils who have not yet mastered their times tables, so that additional support can be provided. Schools will have a 3-week window to administer the MTC, and we will administer the test in small groups in the Summer term of Year 4.

Formal Multiplication Methods

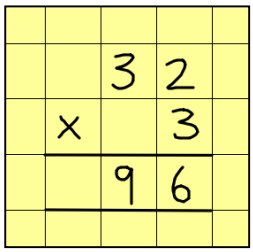
Partitioning is used to introduce multiplying larger numbers.

E.g. 58 x 4 = 232

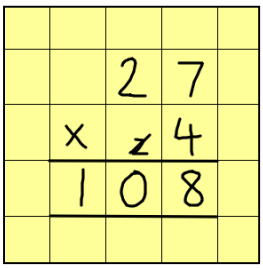
50 x 4	+	8 x 4	
200	+	32	= 232

When children are confident with the place value of multiplication, the short method of multiplication is introduced:

E.g. 32 x 3 = 96



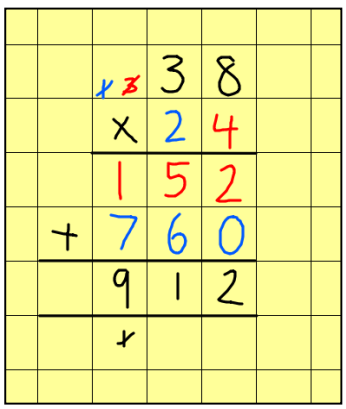
E.g. 27 x 4 = 108



In this example, 7 x 4 = 28. The children are taught to put the ones value (8) in the appropriate column. The carried digit (representing 2 tens) is put above the line in the appropriate column, and crossed out when it has been added.

The short method is used throughout KS2 to multiply any number, including decimal numbers, by a single digit.

When multiplying by two or more digits, long multiplication is used:



E.g. 38 x 24 = 912

In this method, the children multiply by the ones, before moving on to multiply by the tens. When multiplying by the tens digit, it is important to explain that the 0 is a place value holder, making every digit 10 times larger.

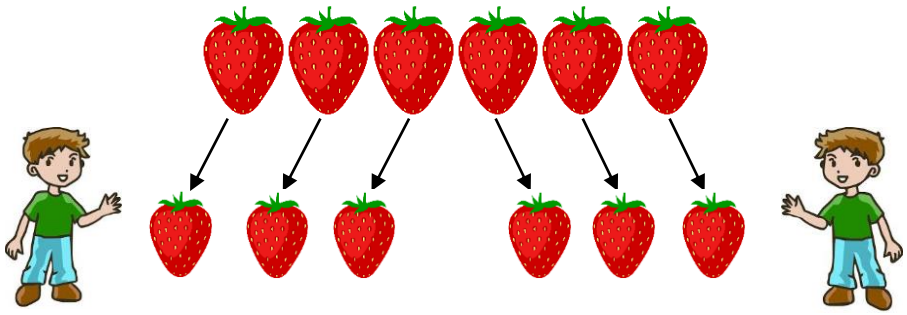
DIVISION

Division is taught alongside multiplication, so that children know that 4 x 3 =12 and 12 ÷ 3 = 4.

Division in Key Stage 1 (Year 1-2)

Initially, division is taught by sharing objects equally, using concrete objects and moving to pictorial representations.

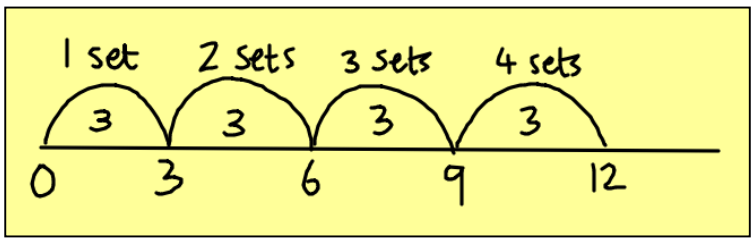
E.g. 6 strawberries shared equally between 2 children = 3 strawberries each



The ÷ sign is introduced and children calculate along a number line:

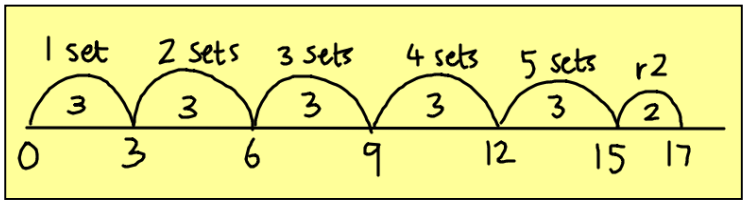
E.g. 12 ÷ 3 = 4

We count in jumps of 3 because we are dividing by 3.



Remainders may be introduced:

E.g. 17 ÷ 3 = 5 r 2



Division in Key Stage 2 (Year 3-6)

In Key Stage 2, the children will work on partitioning numbers to support their understanding of more formal methods.

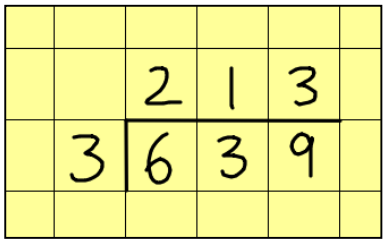
At first, children will partition numbers to calculate division with larger numbers.

E.g. 639 ÷ 3 = 213

600 ÷ 3	=	200
30 ÷ 3	=	10
9 ÷ 3	=	3
200 + 10 + 3 = 213		

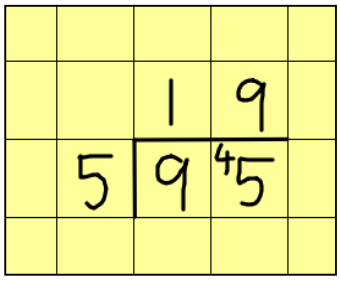
When confident, children will be introduced to short division without any remainders alongside the partitioned calculation:

E.g. 639 ÷ 3 = 213



Children will then move on to short divisions with remainders.

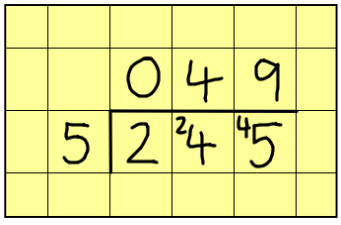
E.g. 95 ÷ 5 = 19



In this example, children will carry out these calculations: 9 ÷ 5 = 1 r 4 (remainder is carried into the next column), 45 ÷ 5 = 9

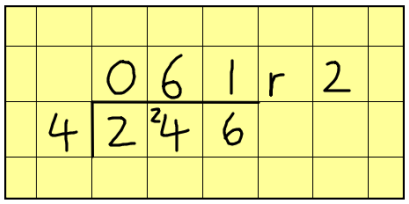
If it is not possible to divide the first digit, the digit is carried over:

E.g. 245 ÷ 5 = 49



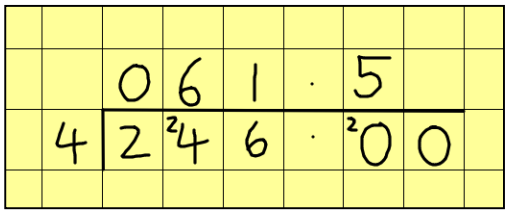
Remainders are initially expressed as follows:

E.g. 246 ÷ 4 = 61 r 2



As the children become secure with this method, they will learn to express remainders as decimals:

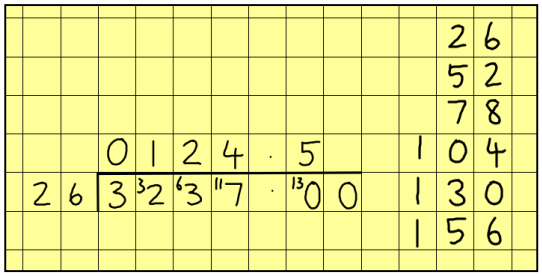
E.g. 246 ÷ 4 = 61.5



In this example, the 'remainder 2' has been continued in to decimal columns. Children are encouraged to write out the decimals points and two place value holders (00) ready to continue the calculation.

In order to divide by a 2 digit number, the same method may be used:

E.g. 3237 ÷ 26 = 124.5



Children are encouraged to list multiples of the divisor (in this case, 26) down the side of their calculation to make their dividing easier.

And finally...

Mathematics is a logical, 'step-by-step' process. Children cannot move onto the next step until they understand the step before. Children learn at different speeds, some learn more quickly, whilst others need to consolidate their learning before they can move on.

Numbers are all around us. Use every opportunity to make maths fun. E.g. counting steps, adding items in your shopping basket, how much change, looking at the contents and weights on packets as you put the shopping away, ordering objects according to size etc.

With your support at home, our children will continue to make outstanding progress in Mathematics at Bailey Green. If you have any concerns about your child's progress, or are wondering how to support them effectively at home, please speak to their class teacher.