PROGRESSION IN MENTAL AND WRITTEN CALCULATIONS

A guide for Parents

Introduction

This booklet is intended to explain the progression through the written methods of calculation taught to children at **St Mary of the Angels**. In order to foster a deeper understanding of calculations it is important that children are not rushed through each stage.

With this in mind we would request that the methods outlined here should only be used to support a child's work once they have been introduced to them within school, since preparatory and practical work are necessary to ensure that the strategies are understood, not simply learned.

The staff at **School name** will write the method to be used at the top of any calculation homework to guide you in using this booklet to support your children with their work.

Mental Calculation Strategies

A key factor of children's understanding in mathematics is the development of mental strategies prior to and alongside the development of written methods. Such strategies will be learnt and consolidated throughout the school as children are always encouraged to look for calculations that can be attempted mentally before considering using a written method. Children do not have to hold all the information for mental calculations in their heads. They can jot down the steps that they are working through on paper to support them with their calculations and younger children may want to draw pictures or use objects to help them with their work.

Mental Calculation Strategies for Addition

When adding two numbers, put the larger one first and count on in ones

Try using two dice, ask your child to put the larger one first and then add on the dots from the second dice. This could be done playing any board game at home when finding how many spaces you have to move altogether.

When adding 6, 7, 8, or 9, split each number into '5 and a bit'

This method of splitting numbers into parts is known as **Partitioning**.

E.g. If your child is trying to add 6 and 8, partition 6 into 5 + 1, and 8 into 5 + 3. Then add 5 + 5 + 3 + 1.

Find a pair totalling ten

From an early age children work hard to learn and become familiar with their number facts to ten. This knowledge can support children in **Reordering** their calculations to make them easier to tackle.

E.g. If your child is trying to calculate 7 + 8 + 3, using the knowledge that 7 + 3 =10 and then adding the 8 to 10 to make 18 is easier than working out 7 + 8 =15 and then adding 3 to make 18.

Using near doubles

If children have instant recall of doubles, they can use this information when adding numbers that are very close to each other. So, knowing that 6 + 6 =12, they can use this to help them find 7 + 6, rather than using a counting on method. This can be extended further up the school. E.g. 38 + 35 is double 35 + 3 or 1.6 + 1.5 is double 1.5 + 0.1

Counting forwards and backwards

Many of the mental strategies that children use require them to be able to count forwards and backwards efficiently. Children will begin counting in ones from an early age but throughout the school children will practice counting from different numbers and in different steps to help them solve calculations.

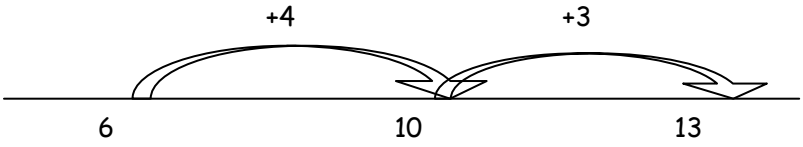
E.g.	4 + 8	count on in ones from 8	40 + 30	count on in tens from 40
	570 + 300	count on in hundreds	1.7 + 0.5	count on in tenths from 1.7

Bridging

If children have an awareness of how to get to the next multiple of ten this can support them in counting on in larger numbers rather than in steps of 1. The use of an empty number line is used in school to model this concept to the children. (Bear in mind that the arrows/jumps do not need to be to scale)

E.g.

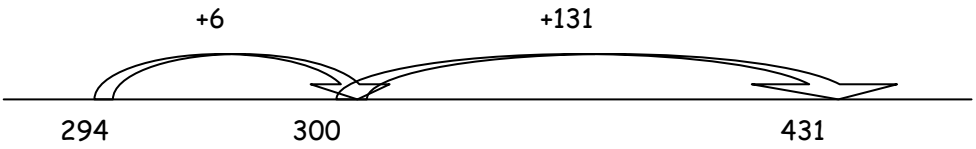
6 + 7 = 6 + 4 + 3 (the 7 has been broken into 4 to reach 10 and then +3)



This would be extended to the use of larger numbers and decimals further as the children progress through school.

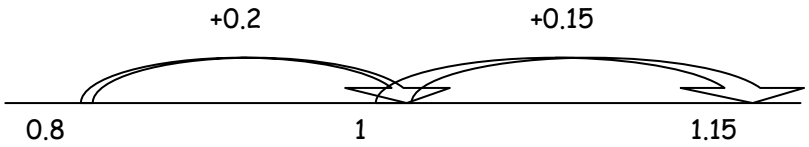
E.g.

294 + 137 = 294 + 6 + 131 (the 137 has been broken into 6 to reach 300 and then +131



E.g.

0.8 + 0.35 = 0.8 + 0.2 + 0.15 (the 0.35 has been broken into 0.2 to make 1 and then +0.15)



Partitioning

It is important for children to know that numbers can be partitioned into , for example, hundreds, tens and ones, so that 326 = 300 + 20 + 6. Once children have the ability to partition numbers they can use this to support them with their addition calculations. Both numbers can be partitioned in this way, although some children may prefer to keep one number as it is (preferably the largest) and partition just the smallest number.

E.g. 23 + 45

Partitioning both numbers	**Partitioning only one number**
20 + 3 + 40 + 5	45 + 20 + 3 (largest number kept the same)
20 + 40 = 60	45 + 20 = 65
3 + 5 = 8	65 + 3 = 68
60 + 8 = 68	

E.g. 540 + 280

Partitioning both numbers	**Partitioning only one number**
500 + 40 + 200 + 80	540 + 200 + 80
500 + 200 = 700	(largest number kept the same)
40 + 80 = 120	540 + 200 = 740
700 + 120 = 820	740 + 80 = 820

At **School Name** children are taught a range of mental methods including those shown in this booklet but each child will have their favourite methods and own way of working. This is encouraged by staff and the range of methods that children use are shared and celebrated within lessons. You may find this is the case at home when you and your child use a different method to solve a mental calculation. If so, ask your child to explain their method to you and tell you why they like that method. Explaining their work is a skill that children find difficult and is something the children and staff at **School Name** have worked on over the last year.

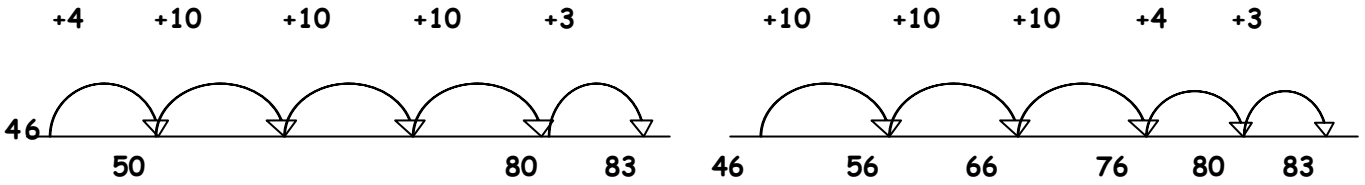
Progression in written methods of Addition

Below is the progression through the informal written methods, expanded written methods and finally the compact written method. Again it is important to emphasise that children should not be rushed through these stages. They should gain a thorough understanding of each method before they move onto the next stage. Children will work horizontally before moving onto vertical methods. The class teachers will indicate on any addition homework which method your child is currently using with the following headings.

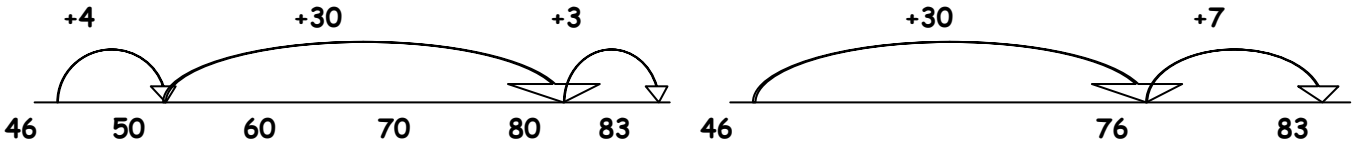
Counting on

This method is similar to the bridging method shown in the mental calculation section and in some cases children will use the bridging method as part of counting on. Children may use number lines for support if required. There is no set way for counting on but children are always encouraged to count on from the larger number. The following calculation was given to the children in Years 3 and 4 at **School Name** and here are some of the ways in which the children counted on to find their answer. You will notice that they have all started from 46 (the largest number in the calculation) and that their jumps along the number line total 37 although the order in which they add the 37 to 46 varies.

37 + 46



In the examples below the children are becoming more efficient and have grouped the three 10s into 30.



Partitioning

When using a partitioning as a step within the written methods we partition both numbers.

E.g. 37 + 46

30 + 40 = **70**

7 + 6 = **13**

70 + 13 = 83

E.g. 136 + 185

100 + 100 = **200**

30 + 80 = **110**

6 + 5 = **11**

200 + 110 + 11 = 321

Progression through the vertical written methods.

1) Expanded vertical method Most significant digit first

287
+145
300 (200 + 100)
120 (80 + 40)
12 (7 + 5)
432

This digit is worth 10 and would be carried below the line in method 3

2) Expanded vertical method Least significant digit first

287
+145
12 (7 + 5)
120 (80 + 40)
300 (200 + 100)
432

This digit is worth 100 and would be carried below the line in method 3

3) Compact written method - Carry below the line

287
+145
432
1 1

This digit is worth 100

This digit is worth 10

These three methods will be worked through at a pace to suit the needs of each child. Some children may prefer to carry on using either method 1 or 2 after method 3 has been introduced. The methods build on the children's understanding, e.g. Methods 1 & 2 show the children where the carry digits in method 3 come from. When working through method 3 children will discuss the fact that the numbers below the line are worth 100 and 10 as shown in methods 1 & 2.