

Progression in Written Calculations

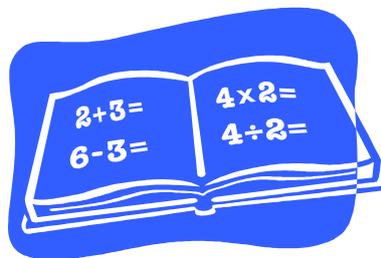


St. Francis'
Catholic Primary

Welcome to the St. Francis' school booklet for written methods in Mathematics. In this booklet, you will find examples and explanations of the written methods children use when recording and calculating in their Maths lessons. Recording of maths work can start as early as Reception, so expect to become familiar with methods used across all four mathematical operations AND within all seven year groups!

Our progression aims to allow children to build a solid foundation of working with numbers mentally, alongside using methods of recording which reinforce understanding of place value. As mastery of each operation develops, more efficient methods can be introduced to children, allowing them to select the methods which work accurately and efficiently for them.

Whilst some of the methods in this booklet will undoubtedly be familiar to you, other methods will not. Children will make their best progress if home and school are working together to reinforce the same methods. As a result, if there are any methods which are unclear, please don't hesitate to meet with your child's class teacher - they will be more than happy to explain them to you.

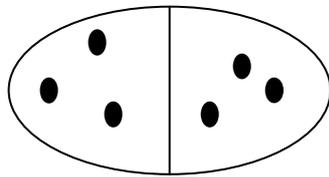


**Happy
Calculating!**

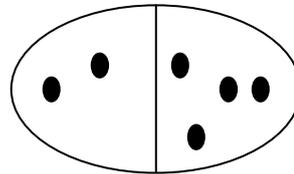
PROGRESSION THROUGH CALCULATIONS FOR ADDITION

RECEPTION

- The ability to count on from random starting points is essential for Reception children. Various songs/games are used to secure this skill.
- Language used includes: add, more, altogether etc.
- Addition problems are practical, visual and meaningful.
- Recording calculations is not a requirement for Reception children but will be done if they are ready for this stage. Calculations will be recorded pictorially (example below), before the introduction of + and = symbols.



3 and 3



2 and 4

YEAR 1

- Practical work/games with counting apparatus.
- Songs and games.
- Mental strategies (put the biggest number in your head and count on – using fingers where appropriate)
- How many more to make...
- Recordings such as $6 + 7 =$
 $6 + \underline{\quad} = 13$
(Extended with two-digit numbers)
- Introduction of number lines and 100 Square to aid addition process.

YEAR 4

- Children will continue to use the methods taught in Year 3 as appropriate. Place value headings for each column will no longer be necessary. Children should become increasingly comfortable in 'carrying' and applying the methods to larger numbers e.g.

	8	5	5
+	7	3	6
<hr/>			
1	5	9	1
<hr/>			
		1	

YEARS 5 and 6

- Children should consolidate the carrying method, applying it to multiple-digit numbers. Using the same approach, they will also add decimal numbers e.g.

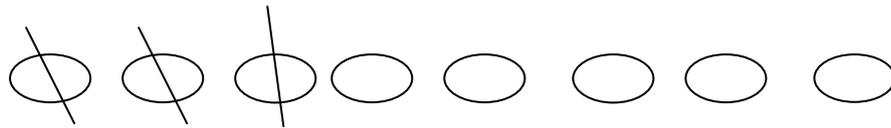
	2	·	4	5
+	4	·	3	7
<hr/>				
	6	·	8	2
<hr/>				
			1	

PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

RECEPTION

- The ability to count backwards from random starting points is essential for Reception children. Various songs/games are used to secure this skill.
- Language used includes: less, take away etc.
- Subtraction problems are practical, visual and meaningful.
- Recording calculations is not a requirement for Reception children but will be done if they are ready for this stage. Calculations will be recorded pictorially (example below) before the introduction of - and = symbols.

8 take away 3



YEAR 1

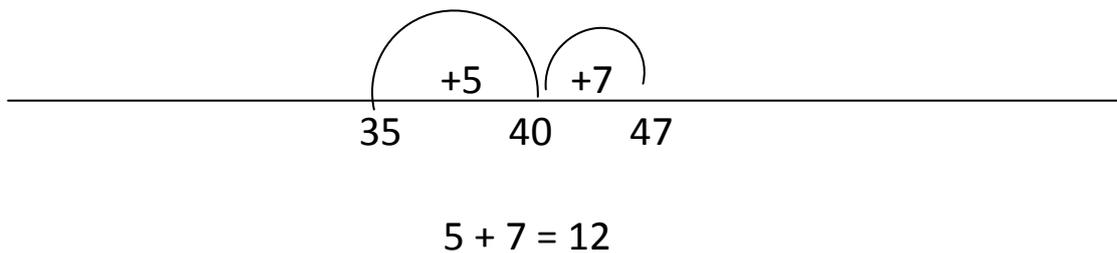
- Practical work/games with counting apparatus.
- Songs and games.
- Children counting back.
- Children develop an understanding of “difference”
- Recordings such as $10 - 6 = 4$
 $10 - \square = 4$
(Extended with two-digit numbers)
- Number line introduced to aid counting back.

YEAR 3

- Understanding of the subtraction process will be supported with the use of the empty number line method (subtraction sum, turned into addition) e.g.

$$47 - 35 =$$

$$\text{becomes } 35 + ? = 47$$



- This will be taught alongside the formal, column method of subtraction. Children will become increasingly reliant on this method and also be introduced to the concept of 'borrowing':

	H	T	U
		5	
	7	6 ¹	2
-	4	3	5
<hr/>			
	3	2	7

YEAR 4

- Children will continue to use the methods taught in Year 3 as appropriate. Place value headings for each column will no longer be necessary. Children should become increasingly comfortable in 'borrowing' and applying the methods to larger numbers e.g.

		7	9	
		8	10	¹ 5
-		4	3	7
<hr/>				
		3	6	8
<hr/>				

YEARS 5 and 6

- Children should consolidate the borrowing method, applying it to multiple-digit numbers. Using the same approach, they will also subtract decimal numbers e.g.

		6		4	
		7	¹ 0	5	¹ 2
-			3	1	4
<hr/>					
		6	7	3	8
<hr/>					

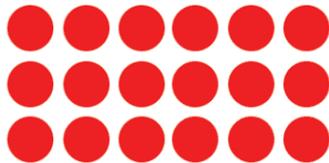
Progression in Multiplication

Reception

- Children will count in multiples of two (up to twenty) and multiples of ten (up to one hundred). This is done forwards and backwards.
- Counting in twos is supported with practical problems involving counting pairs e.g. socks.
- The 100 Square is studied to identify patterns in numbers.

Year 1

- Children are introduced to multiplication through practical examples: creating 'sets of', arrays, grouping etc.



$$6 \times 3 = 18$$

$$3 \times 6 = 18$$

Year 2

- Children will be introduced to the multiplication symbol. Children begin to multiply using repeated addition e.g.

$$\begin{aligned} 3 \times 4 \\ = 4 + 4 + 4 \\ = 12 \end{aligned}$$

- Children understand that multiplication can be done in any order e.g.

$$\begin{array}{ll} 5 \times 4 & 4 \times 5 \\ = 4 + 4 + 4 + 4 + 4 & = 5 + 5 + 5 + 5 \\ = 20 & = 20 \end{array}$$

- Calculation is aided by creating 'sets of', using practical resources, number lines etc.

Year 3

- Children in Year 3 will aim to multiply a two digit number by a single digit number. The grid method will be introduced to aid understanding of this process e.g.

$$24 \times 6 =$$

X	20	4
6	120	24

$$\begin{array}{r} 24 \\ 120 \\ \hline 144 \end{array}$$

- Children who are confident in understanding this process will move on to recording calculations using the formal, column method e.g.

	T	U
	2	4
X		6
<hr/>		
1	4	4
	2	

Year 4

- Children continuing to work towards understanding the process of multiplication will consolidate their use of the grid method, using larger numbers as appropriate e.g.

$$136 \times 7 =$$

X	100	30	6
7	700	210	42

$$\begin{array}{r} 42 \\ 210 \\ \hline 700 \\ \hline 952 \end{array}$$

- Children who are confident in understanding this process will record calculations using the formal, column method e.g.

	2	6	4
x			3
<hr/>			
	7	9	2
	1	1	

Years 5 and 6

- Children are expected to build on the formal, column method of multiplication, using increasingly large numbers. Long multiplication will be introduced as children work towards multiplying by 2-digit numbers e.g.

$$264 \times 37 = 9768$$

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

- When children are confident in multiplying 4-digit numbers by 2-digit numbers, the method will also be applied to multiplying decimal numbers e.g. $62.4 \times 17 = 1060.8$

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

Alternatively, children may find it easier to ignore the decimal point completely. In this example, 62.4×17 becomes 624×17 :

$$624 \times 17 = 10608$$

Knowing where to place the decimal point can be confirmed by looking at the original calculation. The number of digits after any decimal point indicates how many digits should be after the decimal point in the answer:

$$62.4 \times 17$$

Reception

- Children are introduced to the concept of division through sharing.
- Practical problems are used alongside visual resources e.g. 3 pirates need to share 12 gold coins fairly.
- Extended problems introduce the idea of remainders e.g. 3 pirates need to share 13 gold coins fairly.
- Similar problems are also used for halving.

Year 1

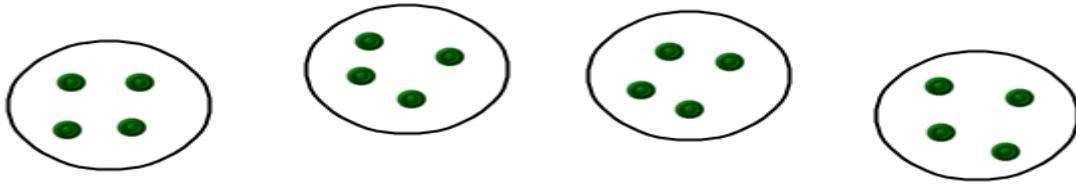
- Work introduced in Reception is built upon by continuing to use practical resources to work through examples of sharing and remainders. Numbers used increase in difficulty as appropriate.

Year 2

- Children will continue to be taught division through practical examples of sharing. Numbers used and remainders will continue to increase in difficulty as appropriate.
- Children will apply appropriate vocabulary e.g. shared between.
- Children working confidently may be introduced to the division symbol, if appropriate.

Year 3

- All children are introduced to the division symbol. They are expected to divide two digit numbers by a single digit number. Calculation will be aided by drawing 'sets of' e.g. $16 \div 4 = 4$



- Alongside using practical resources, children will record their calculations using the formal written method, often referred to as the 'Bus Shelter' method:

$$\begin{array}{r} 4 \\ 4 \overline{) 16} \end{array}$$

Year 4

- Children extend their understanding of the 'Bus Shelter' method by using larger numbers and calculating remainders. Visual resources such as 'Base 10' equipment will be used alongside written recordings to aid understanding of the process:

$$549 \div 9 = 61$$

$$\begin{array}{r} 61 \\ 9 \overline{) 549} \end{array}$$

$$509 \div 7 = 72 \text{ remainder } 5$$

$$\begin{array}{r} 72 \\ 7 \overline{) 509} \end{array} \text{ remainder } 5$$

Year 5 and 6

- Children are expected to consolidate use of the 'Bus Shelter' method and comfortably divide 4-digit numbers by a single-digit number, interpreting remainders appropriately.
- The 'Bus Shelter' method will also be applied for dividing 4-digit numbers by 2-digit numbers. Children will write out the appropriate list of multiples to aid this process e.g.

$$372 \div 15 = 24 \text{ remainder } 12$$

			2	4	r ¹²		
1	5)	3	7	2	1	5
						3	0
						4	5
						6	0

- Further extension of this method can be explored by dividing numbers to obtain a decimal answer, as opposed to a remainder e.g.

$$54 \div 12 = 4.5$$

			4	.	5		
1	2)	5	4	0	1	2
						2	4
						3	6
						4	8
						6	0

By the end of Year 6, children will have both mental and written methods of calculation for all four operations. Method selection will depend on the numbers involved.

Children should not progress to the next stage with any written method if:

- ***They are not ready.***
- ***They are not confident.***

Children should be encouraged to approximate answers before calculating and to check their answers after calculation – do answers sound reasonable?

Children who make persistent mistakes should return to the method that they can use accurately until they are ready to move on.

