# Marazion School Mathematics Calculation Policy 

 MMXXIII

## Introduction

The purpose of this document is provide information and clarity about the calculations which are required to be learnt by primary aged children as part of the primary mathematics curriculum.

This policy aims to model and explain key mathematical principles and methods taught on a daily basis at Marazion school. The policy also demonstrates progression as students move through different year groups and classes throughout their school life and ensures consistency when teaching mathematics.

The main focus of this policy is the four mathematical operations (addition, subtraction, multiplication and division) particularly written strategies requiring workings. The policy also makes links to mental calculation, it is crucial that these strategies are discretely taught and linked to written strategies and not limited to starter or arithmetic lessons.

One key intention of this calculation policy is to provide detail and ease of access for its readers. The methods in the policy are detailed with:

- The relevant year group,
- Pictorial examples,
- Written teaching/advise points,
- A video example by a pupil accessible via a QR code.

Note: In order to access a video example, a QR code reader is required. A QR code reader can be downloaded via an app onto any mobile device. Once downloaded, the app can be used to scan the QR code either from the screen of a computer or from a printed example of the document.

## Marazion Maths

## Mission Statement

Teach, Learn, Confuse, Understand

At Marazion School we aim to:

- To relentlessly teach mathematics through the fundamentals of fluency, problem solving and reasoning which permits children to develop a clearer and deeper understanding of the rules, methods, variations and anomalies of mathematics.
- To also allow pupils an opportunity of becoming mathematically literate through knowledge of number facts, the four operations, relevant methods and the best strategy to use and be able to apply these to everyday-life problems.
- To finally give pupils an opportunity to develop their mathematical thinking and creativity capacity through enhancing opportunities for problem solving and reasoning, which will give students a mindset to solve problems of the present and the future and potentially make a difference in the world.


## ADDITION

## Foundation Stage


Year 1
Addition

## Year 2

| Year 2 <br> Addition | Use of partitioning to add numbers. $40+7=47$ <br> Base ten resources to support. |  |
| :---: | :---: | :---: |



## Year 3

| Expanded <br> Column <br> Addition <br> Method | $\begin{array}{r} \mathrm{H} \\ \hline 300 \mathrm{~T} \\ +\quad \mathrm{O} \\ +\quad 200 \\ \hline 50203 \\ \hline 538 \end{array}$ <br> Teaching Points <br> - Calculate from ones column, <br> - Label H T O etc in columns, <br> - One digit per square. |  |
| :---: | :---: | :---: |


|  |  |  |
| :---: | :---: | :---: |
| Introduce <br> Column <br> Addition <br> Method | Teaching Points |  |


|  | - Progression from expanded to compact method (modelled alongside expanded method) <br> - Calculate from ones column, <br> - Label HTO etc in columns, <br> - One digit per square. |  |
| :---: | :---: | :---: |

## Year 5

| Column <br> Addition <br> Method | Hth Tth $T$ <br> 1H <br> Teaching Points <br> - Moving on from year 4 to numbers up to one million, <br> - Use rounding to estimate, <br> - Calculate from ones column, <br> - Label H T O etc in columns, <br> - One digit per square, <br> - Optional use of comma in final answer. |  |
| :---: | :---: | :---: |
| Column Addition Method up to 2 decimal places | $\begin{array}{r} £ 132.52 \\ +\quad £ 213.83 \\ \hline £ 346.35 \\ \hline \end{array}$ <br> Teaching Points <br> - Progressing to addition of numbers with two decimal places within a given context, <br> - Use rounding to estimate e.g. $£ 130$ + $£ 210=£ 340$ <br> - Calculate from ones column, <br> - One digit per square. |  |

## Year 6

| Column Addition Method | $\begin{array}{r} 3,643,124 \\ +3,227,731 \\ \hline 6,870,855 \\ \hline 1 \\ \hline \end{array}$ <br> - Progressing to addition of numbers up to ten million, <br> - Initially when dealing with numbers of this size avoid calculations which involve multiple 'carrying', <br> - Reiterate the value of each digit when modelling, <br> - Use of rounding to estimate. |  |
| :---: | :---: | :---: |
| Column Addition Method up to 3 decimal places | $\begin{array}{r} 0.557 \\ +\quad 1.211 \\ 0.202 \\ \hline 1.970 \\ \hline 1 \end{array}$ <br> Teaching Points <br> - Progressing to addition of numbers up to ten million, <br> - Initially when dealing with numbers of this size avoid calculations which involve multiple 'carrying', <br> - Reiterate the value of each digit when modelling, <br> - Reiterate the importance of 0's as place holders where appropriate. |  |

## Resources to support learning throughout all year groups:



- Base ten materials,
- Numicon,
- Place value counters,
- Arrow cards.



## 900 9|0 9


$999=900+90+9$

Ben is using arrow cards to make


|  | $\text { Yegr } 1$ |  |
| :---: | :---: | :---: |
| Year 1 <br> Subtractio <br> n | Use practical resources to work systematically crossing out to subtract. Ensure real example of taking away. $\qquad$ <br> Continue usage of number lines, promoting increase of jumps and more than one number at a time. <br> Working towards finding the difference between numbers nearer the end of the year. <br> Variation activities through missing number problems. $\begin{aligned} & \square=7-3 \\ & 4=\square-3 \\ & 4=7-\square \end{aligned}$ |  |

## Year 2

Year 2

Subtraction $\quad$| Continue use of number lines, |
| :--- |
| increasing initial starting number. |
| Begin with calculations which cross |
| tens barrier. E.g. $42-5, ~ b e f o r e$ |
| increasing difficulty to subtracting |
| tens and then ones. |

## Year 3



|  | - Introduce use of inverse to check calculation, <br> - One digit per square. |  |
| :---: | :---: | :---: |
| Introduce Column Subtraction Method | $\begin{aligned} & \mathrm{H} \text { T O } \\ & \hline 9245 \\ & 2 \\ & \hline 71 \\ & \hline 7 \end{aligned}$ <br> Teaching Points <br> - Calculating subtractions with numbers up to 1000, <br> - No exchanging at this stage, <br> - Begin subtraction from ones column, <br> - Introduce use of inverse to check calculation, <br> - One digit per square. |  |

## Year 4

| Column Subtraction Method | $\begin{array}{r} 21 \\ \$ 46 \\ -\quad 163 \\ \hline 183 \\ \hline \end{array}$ <br> Teaching Points <br> - Calculating subtractions with numbers up to 10,000, <br> - Vocabulary use of exchange rather than borrow, <br> - Use resources to practically model exchange until secure, <br> - Begin subtraction from ones column, <br> - Begin formal method by only using one exchange per calculation until secure, <br> - Introduce use of inverse to check calculation, <br> - One digit per square. |
| :---: | :---: |



- Calculating subtractions with numbers

Vocabulary use of exchange rather than borrow,

- Use resources to practically model exchange until secure,
- Begin subtraction from ones column,
- Begin formal method by only using one exchange per calculation until secure,
- Introduce use of inverse to check
- One digit per square.


## Year 5

| Subtraction using a number line | $12462-2300=10,612$ <br> 10612 <br> $-2000$ <br> $-300$ <br> Teaching Points <br> - Calculating subtractions with numbers up to 10,000 , <br> - Use of number line drawn with ruler a promoted strategy, <br> - Can subtract or count on, ensure if subtracting jumps occur beneath line, if counting on jumps above line, <br> - Begin subtraction from ones column. |  |
| :---: | :---: | :---: |
| Column Subtraction Method | $\begin{array}{r} 7,89916 \\ -2,598 \\ \hline 5,3008 \\ \hline \end{array}$ <br> Teaching Points <br> - Introduce subtraction with larger numbers up to one million, <br> - Vocabulary use of exchange rather than borrow, <br> - Progress to calculations with multiple exchanges, <br> - Estimation of answer promoted e.g. $7900-2600=5300$ <br> Use of inverse to check calculation. |  |

## Year 6

| Column Subtraction Method | $\begin{array}{r} 61 \quad 21 \\ 9,843, \$ 32 \\ -\quad 7,351,140 \\ \hline 2,392,192 \\ \hline \end{array}$ <br> Teaching Points <br> - Introduce subtraction with larger numbers up to ten million, <br> - Multiple exchanges in calculations, <br> - Estimation of answers promoted, <br> - Use of inverse to check calculation. |  |
| :---: | :---: | :---: |
| Column Subtraction up to 3 decimal places | $\begin{array}{r} 315.6 又 10 \chi_{12} \\ -\quad 8.653 \\ \hline 27.059 \\ \hline \end{array}$ <br> Teaching Points <br> - Introduce subtraction with numbers up to 3 decimal places, <br> - Multiple exchanges in calculations, <br> - Introduce calculations with 0's as place value holders. |  |



## MULTIPLICATION

## Foundation Stage

| Foundation Stage |  |
| :---: | :---: | :---: | :---: |
| Multiplication |  |
| Ensure children must use same |  |
| number. | Focus on doubling |
| Use symmetry to embed |  |
| doubling. |  |
| concrete objects such as base |  |
| ten and counters to visually |  |
| demonstrate doubling. |  |

Year 1
Multiplication
Ensure embedded
understanding on concept of
doubling before advancing
further.
Use concrete objects, image
representations and arrays to
show repeated addition.
Begin to count in 2's, 5's and
10's linking to times tables
recall.

## Year 2

| Year 2 |
| :--- | :--- |
| Multiplication | \left\lvert\, | Pupils begin to learn and recite |
| :--- |
| X2, X5 and X10. Use doubling |
| to find X4 where appropriate. |
| Recap repeated addition and |
| use of arrays. |
| $3+3+3+3+3=15$ |$\quad$| Combine repeated addition |
| :--- |
| steps to write calculation as |
| $5 \times 3$ and demonstrate how |
| this is equivalent to $3 \times 5$. |\right.



## Year 3



## Year 4

| Year 4 Grid Method | $x$ 3 <br> 30 90 <br> 4 12 <br>  102 <br> Teaching Points <br> - Practise times tables (up to 12 x ) on daily basis, <br> - Apply times tables to grid method, <br> - Promote listing of tables to assist calculations, <br> - Use doubling to assist calculations e.g. double $2 x$ to find $4 x$ tables. |  |
| :---: | :---: | :---: |
| Year 4 Expanded Column Method | Teaching Points <br> - Practise times tables (up to 12x) on daily basis, <br> - Ensure lining up of columns, <br> - Promote listing of tables to assist calculations, <br> - Use doubling to assist calculations e.g. double $2 x$ to find $4 x$ tables, <br> - One number per square. |  |

## Year 5



|  | $\bullet$Escalate difficulty of calculation to <br> two digit multiplied by digit <br> multiplication. |  |
| :--- | :--- | :--- | :--- |

## Year 6

| Year 6 Column Multiplication Method | 1514 <br> $\times \quad$23 <br> 4542 <br> 4 <br> 30280 <br> 4 <br> 34822 <br> Teaching Points <br> - Practise times tables (up to $12 x$ ) on daily basis, <br> - Progress to example 4 digit multiplied by 2 digit, <br> - Explanation of 10 's rule and 0 applied, <br> - Begin by reinforcing 2 digits by 2 digits multiplication from year 5 . |  |
| :---: | :---: | :---: |

## Resources to support learning throughout all year groups:

multiply 10


- Base ten,
- Cubes,
- Bar models,
- Concrete objects.



|  | Introduce method of arrays to put different numbers into groups. $12 \div 3=4$ <br> Begin to stretch pupils by investigating different division facts, have mathematical discussions related to finding the inverse. $\begin{array}{ll} 6 \div 2=\square & \square=6 \div 2 \\ 6 \div \square=3 & 3=6 \div \square \\ \square \div 2=3 & 3=\square \div 2 \\ \square \div \nabla=3 & 3=\square \div \nabla \end{array}$ |  |
| :---: | :---: | :---: |

## Year 2



|  | Grouping - E.g. How many 3's <br> make 18? <br> Grouping |  |
| :--- | :--- | :--- |
|  | Ensure sharing uses jumps <br> beneath line and grouping uses <br> jumps below the line. |  |


| Year? |  |  |
| :---: | :---: | :---: |
| Introduce Chunking Division Method | $\begin{array}{r} 13 \\ (4 \times \underline{10}=40)-\underline{40} \\ (4 \times \underline{3}=12)- \\ \frac{12}{52} \\ \frac{12}{0} \end{array}$ <br> Teaching points <br> - Clear and frequent modelling of layout, <br> - Begin chunking with $2 x, 3 x$ and $5 x$ tables before moving onto more complex, <br> - Use remainder instead of decimal answers at this stage, <br> - First question is 'can I take a chunk of 10', <br> - Check answers using inverse. |  |


| $\text { Ye?r } 4$ |  |  |
| :---: | :---: | :---: |
| Chunking <br> Division <br> Method | $\begin{array}{r} 13 r 1 \\ 4 \stackrel{53}{53} \\ (4 \times \underline{10}=40)-\frac{40}{12} \\ (4 \times \underline{3}=12)- \\ \frac{12}{1} \end{array}$ <br> remainder <br> Teaching points <br> - Clear and frequent modelling of layout, <br> - Develop to eventually divide 3 digit numbers by 1 and 2 digits, <br> - Use remainder instead of decimal answers at this stage, <br> - First question is 'can I take a chunk of $10^{\prime}$, <br> - Check answers using inverse. |  |


| $\text { Yedr } 5$ |  |  |
| :---: | :---: | :---: |
| Short <br> Division (bus stop) <br> Method | Teaching points <br> - Still use chunking method if required, |  |


|  | • Writing times tables next to |
| :--- | :--- | :--- | :--- |
| calculation promoted, |  |$\quad$|  | Begin with providing answers <br> with a remainder, |  |
| :--- | :--- | :--- |
|  | Develop to providing answers <br> as fraction and then decimal <br> point e.g. 3/6 then 0.5. |  |

## Year 6

| Short <br> Division (bus stop) <br> Method | $\begin{array}{rrr} 01966.5 & \\ 6 \mid 11_{5} 77_{3} 9.30 & \\ 6 & 30 & 54 \\ 12 & 36 & 60 \\ 18 & 42 & 66 \\ 24 & 48 & 72 \end{array}$ <br> Teaching points <br> - Use bus stop method to quickly find division answers with divisors up to 12, <br> - Use tables knowledge to find answers to division questions with larger divisors such as 13 , 15 or 20 etc, <br> - Target to work efficiently and at speed. |  |
| :---: | :---: | :---: |
| Chunking Division Method |  057 <br>  $1 4 \longdiv { 7 8 4 }$ <br> $(14 \times \underline{50}=700)$ $-\frac{700}{084}$ <br> $(14 \times \underline{5}=70)$ $\underline{70}$ <br>  14 <br> $(14 \times \underline{2}=14)$ $\underline{14}$ <br> $50+5+2=57$ 00 |  |





| multiples of the same number. | Teaching points <br> - Use questions with answers larger than a whole, <br> - Introduce conversion of improper fractions (6/7) to mixed number (1 1/6), <br> - Use knowledge of times tables for quick and efficient conversion, <br> - Ensure when making fractions larger both the numerator and denominator are multiplied. |  |
| :---: | :---: | :---: |
| Multiply proper fractions by whole numbers. | $\begin{gathered} 1 / 5 \times 3=3 / 5 \\ 3 / 5 \times 4=12 / 5=22 / 5 \end{gathered}$ <br> 2 wholes and 2/5 left over. <br> Teaching points <br> - Use questions with answers larger than a whole, <br> - Introduce conversion of improper fractions (6/7) to mixed number (1 1/6), <br> - Use knowledge of times tables for quick and efficient conversion, |  |


|  | - Model using diagrams and encourage use of drawn diagrams. |  |
| :---: | :---: | :---: |
| $\text { Year } 6$ |  |  |
| Add and subtract fractions with different dominators. | $\begin{aligned} & \quad 2 / 7-1 / 9 \\ & 7 \times 9=63 \\ & 2 \times 9=18 \\ & 1 \times 7=7 \\ & 18 / 63-7 / 63=11 / 63 \\ & \text { Teaching points } \\ & \text { - Remind children to } \\ & \quad \begin{array}{l} \text { multiply the } \\ \text { denominator - } \\ \text { denominator needs to be } \\ \text { the same for adding and } \\ \text { subtracting. } \end{array} \\ & \text { - Multiply each numerator } \\ & \text { by the number the child } \\ & \text { multiplied the } \\ & \text { denominator } \\ & \text { - If mixed number see } \\ & \text { Year } 5 \text { converting } \\ & \text { method } \end{aligned}$ |  |
| Multiply | $\begin{array}{r} 4 / 5 \times 400 \\ 4 \times 400=1,600 \end{array}$ |  |


| Multiply a fraction by a hole number | $1,600 / 5=320$ <br> Teaching points <br> - Remind children the denominator is how many parts the whole is cut into <br> - Multiply the nominator by the whole number giving the child an improper fraction <br> - Child to convert the improper fraction to a mixed number - or in the above case, a whole number <br> - If mixed number see Year 5 converting method |  |
| :---: | :---: | :---: |
| Divide | 6 / 3/2 |  |
| Divide a fraction by a whole number | 6/1/3/2 |  |
|  | $6 / 1 \times 2 / 3$ |  |
|  | $6 \times 2=12$ |  |
|  | $1 \times 3=3$ |  |
|  | $=12 / 3 \text { or } 4$ <br> Teaching points |  |
|  | - Children need to write the whole number as a fraction <br> - To divide a fraction you need to multiply the |  |


|  | reciprocal of the second fraction - flip the fraction <br> - Multiply the numerator by the numerator and the denominator by the denominator <br> - Simplify the fraction where needed <br> - If mixed number see Year 5 converting method |  |
| :---: | :---: | :---: |
| Find a fraction of a whole number | $\begin{gathered} 7 / 10 \text { of } 30 \\ 30 / 10=3 \\ 7 \times 3=21 \end{gathered}$ <br> Teaching points <br> - Divide the whole number by the denominator <br> - Multiply that answer by the numerator <br> - If mixed number see Year 5 converting method |  |

