**St Michael and All Angels Catholic Primary School**

**Calculations Policy**

At St Michael and All Angels we have a committed to the development of children as confident and numerate mathematicians. The development of a love for mathematics will lead to our children becoming successful mathematicians.

As teachers, we understand that we must equip our children with the skills for basic calculation (addition, subtraction, multiplication and division) with consistent approaches to calculation and application. These skills form the basis of their life skills involving mathematics.

Using and applying is a key theme and one of the aims of the National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of context, these include:

* Using inverse
* Missing box questions
* Using units of measure including money and time
* Word problems
* Open ended investigations

*It is important to stress that within our school;*

* Children will be encouraged to approximate their answers before calculating.
* Children will be encouraged to check their answers after calculations are made.
* Children will be encouraged to consider if a mental calculation is appropriate before using written calculations.

Our calculation policy will always inform the planning and teaching of calculation across the school.

**Aims:**

* To develop a consistent approach to the teaching of calculation from Foundation Stage to Year 6.
* To introduce the how a strong knowledge of calculation strategies can be applied to a range of contexts.
* To develop numerate children through the ‘mastery approach’ to calculation.
* Provide children with vocabulary to talk about and explain mathematical calculation.
* Encourage the children to distinguish between written and mental calculation and when these are appropriate methods to choose.
* To equip children with the skills to calculate, check and problem solve using knowledge of number.

# Use of Mathematical Symbols in Calculation

# Equals Sign =

Understanding the purpose and use of the equals sign is imperative for children from an early age and must be taught to be used accurately.

The equals sign translates as **‘the same as’.** All calculations using the equals sign must be balanced.

Children must have valuable experience of a range of word sentences in a range of forms:

7 + 3 = 10

10 = 7 + 3

7 + 3 = 8 + 2

7 + 3 = 5 x 2

7 + 3 = 20 -10

7 + 3 = 100 ÷ 10

**> (more than) and < (less than) symbols**

Once children are confident with the concept of the equals sign in calculation, they must be given the opportunity to use > & < symbols. In the new curriculum this is recommended as a suitable skill for children in stage two onwards. Throughout the school pupils must be provided with numerous opportunities to use these symbols in their calculation work.

7 + 3 > 4 x 2

76 – 32 < 23 x 2

**Using Brackets**

## If the brackets are already in the calculation you would undertake the operations with the brackets first. However if there are no brackets use the BODMAS rule.

## Order of Operations

**Do things in Brackets First.** Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| yes |   | 6 × (5 + 3) | = | 6 × 8 | = | **48** |   |
| no |   | 6 × (5 + 3)  | = | 30 + 3 | = | 33 | (wrong) |

## BODMAS:

**B** = Brackets first **O** = Orders (powers and square roots) **DM** = Division and multiplication (left to right)

**AS** = Addition and Subtraction (left to right)

|  |  |
| --- | --- |
|  |   |

# Using Symbols To Develop Recording

Children will use different methods of recording mental strategies that include:

Arrow Diagrams

5 and 1 → 6 5 + 1 → 6

Number Sentences

3 + 4 = 3 + 8 = 59 = 5 +

 + 5 = 8 + = 71 67 + = 231

These should be developed throughout KS1 and KS2.

**Calculation and the Foundation Stage**

The foundation stage profile outlines a clear progression in the development of children’s addition and subtraction calculation skills and the beginnings of multiplication and division. It emphasises the need for the work to be primarily mental and focuses on understanding numbers and applying that in the context of simple problems. However, when it is appropriate the teacher may want the child to make informal recordings as demonstrated in this policy. Children should be encouraged to develop their Mathematical understanding through continuous provision.

**Mathematics development involves providing children with opportunities to practise and improve their skills in counting numbers, calculating simple addition and subtraction problems, and to describe shapes, spaces, and measures.**

|  |
| --- |
| **Calculation Guidelines for Foundation Stage** |
| ADDITION | SUBTRACTION | MULTIPLICATION | DIVISION |
| Children begin to record in the context of play or practical activities and problems. |
| Begin to relate addition to combining two groups of objects • Make a record in pictures, words or symbols of addition activities already carried out. • Construct number sentences to go with practical activities • Use of games, songs and practical activities to begin using vocabularySolve simple word problems using their fingersCan find one more to ten.All children will progress to using a number line. They jump forwards along the number line using their fingers.  | Begin to relate subtraction to ‘taking away’ • Make a record in pictures, words or symbols of subtraction activities already carried out• Use of games, songs and practical activities to begin using vocabulary • Construct number sentences to go with practical activities • Relate subtraction to taking away and counting how many objects are left.Can find one less to ten.All children will progress to using a number line. They jump backwards along the number line using their fingers. Counting backwards along a number line using finger. | Real life contexts and use of practical equipment to count in repeated groups of the same size:• Count in twos; fives; tensAlso chanting in 2s and 10s.  | Share objects into equal groups Use related vocabularyActivities might include:       Sharing of milk at break time       Sharing sweets on a child’s birthday       Sharing activities in the home corner       Count in tens/twos       Separate a given number of objects into two groups (addition and subtraction objective in reception being preliminary to multiplication and division)Count in twos, tensHow many times?How many are left/left over?GroupAnswerRight, wrongWhat could we try next?How did you work it out?Share outHalf, halve |

**Progression Through Calculation Year 1 – Year 6**

### REASONS FOR USING WRITTEN METHODS

* To aid mental calculation by writing down some of the numbers and answers involved
* To make clear a mental procedure for the pupil
* To help communicate methods and solutions
* To provide a record of work to be done
* To aid calculation when the problem is too difficult to be done mentally
* To develop and refine a set of rules for calculations

### WHEN ARE CHILDREN READY FOR WRITTEN CALCULATIONS?

### *Addition and subtraction*

* Do they know addition and subtraction facts to 20?
* Do they understand place value and can they partition numbers?
* Can they add three single digit numbers mentally?
* Can they add and subtract any pair of two digit numbers mentally?
* Can they explain their mental strategies orally and record them using informal jottings?

# *Multiplication and division*

* Do they know the 2, 3, 4, 5 and 10 time table
* Do they know the result of multiplying by 0 and 1?
* Do they understand 0 as a place holder?
* Can they multiply two and three digit numbers by 10 and 100?
* Can they double and halve two digit numbers mentally?
* Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
* Can they explain their mental strategies orally and record them using informal jottings?

**The above lists are not exhaustive but are a guide for the teacher to judge when a child is ready to move from informal to formal methods of calculation.**

**Mental Calculation**

At St Michael and All Angels we feel it is important that a child’s mental methods of calculation are regularly practised and secured alongside their learning and use of written methods. Our aim is that children will use mental methods when appropriate but for calculations that they cannot do in their heads, they use a written method accurately and confidently.

Children will be taught to acquire the skills to calculate mentally in a confident and clear way. They will know that they can rely on both written and mental methods and feel confident that they can choose when each of these is appropriate. Mental calculation will be built into maths lessons as well as basic skills lessons every day.

**MENTAL CALCULATION STRATEGIES ADDITION AND SUBTRACTION**

|  |  |  |  |
| --- | --- | --- | --- |
| **STRATEGY** | **EXAMPLE** | **SKILLS & KNOWLEDGE** | **MODELS & IMAGES** |
| **REORDERING** | **- LARGEST NUMBER FIRST****- PAIRS TO MAKE MULTIPLES OF 10****- CHANGE THE ORDER (28+17-18=28-18+17)** | * + **COMMUTATIVITY FOR ADDITION**
	+ **PLACE VALUE**
	+ **NUMBER FACTS TO 10**
 | **Number line****Bead string****Number square****Place Value cards****ITP Counting on and back** |
| **NEAR DOUBLES** | **35 + 36 = 35 + 35 + 1 = 70 + 1 = 71** | * + **KNOW DOUBLES OF NUMBERS BY HEART**
 | **Dominoes** |
| **ADJUSTMENT (COMPENSATION)** | **35 + 9 = 35 + 10 – 1 =****47 – 9 = 47 – 10 + 1 =** | * **COUNTING IN STEPS OF 10 AND 1**
* **ROUNDING TO THE NEAREST MULTIPLE**
 | **Number line****Bead string****Number square****ITP Counting on and back** |
| **BRIDGING THROUGH MULTIPLES OF 10** | **37 + 16 = 37 + 3 + 13 = 40 + 13 = 53****93 – 36 = 93 – 30 -3 -3 = 57** | * **NUMBER FACTS TO 10**
* **NUMBER COMPLEMENTS TO 100**
 | **Number line****Bead string****Number square****ITP Counting on and back****ITP Bead Sticks** |
| **PARTITIONING** | **- INTO 10S AND ONES****- TO BRIDGE THROUGH A MULTIPLE OF 10 53-26 = 53 – 3 – 23** **55+26=55+20+5+1=81** | * + **PLACE VALUE**
	+ **NUMBER FACTS TO 10**
 | **Place Value cards****Number line****Bead strings****Base 10** |
| **COUNTING UP TO FIND A SMALL DIFFERENCE BETWEEN NUMBERS** | **304 – 287 = 17****287 + 13 = 300****300 + 4 = 304****287 + 17 = 304 Model on no. line** | * **UNDERSTANDING SUBTRACTION IS THE INVERSE OF ADDITION**
* **KNOWLEDGE OF RELATIVE POSITION OF NUMBERS**
 | **Number line****Bead strings****ITP Difference** |

**MENTAL CALCULATION STRATEGIES MULTIPLICATION AND DIVISION**

|  |  |  |  |
| --- | --- | --- | --- |
| **STRATEGY** | **EXAMPLE** | **SKILLS & KNOWLEDGE** | **MODELS & IMAGES** |
| **DOUBLING & HALVING** | **FIND 36 X 8****72 x 4 = 288** | **KNOWLEDGE OF DOUBLES AND HALVES OF NUMBERS** |  |
| **MULTIPLYING & DIVIDING BY MULTIPLES OF 10** | **FIND 40 X 7 BY KNOWING 4 X 7 AND MULTIPLYING THE ANSWER BY 10.****FIND 560 ÷ 8 = 7** | **EFFECT OF MULTIPLYING AND DIVIDING BY 10****PLACE VALUE** | **ITP Moving Digits****ITP Bead sticks****ITP Number dials****Place Value chart** |
| **PARTITIONING** | **17 X 8 = (10X8) + (7X8)****= 80 + 56****= 136****84 ÷ 7 =****(70 + 14) ÷7****10 + 2 = 12** | **PLACE VALUE** | **ITP x grid****ITP Arrays** |
| **FACTORISING** | **18 X 7 = (2 X 9) X 7****= 2 X (9 X 7)****=2 X 63****= 126****280 ÷ 20 =****280 ÷ (10X2) =****(280 ÷ 10) ÷ 2 =****28 ÷ 2 = 14** | **FACTORS OF NUMBERS****ASSOCIATIVE LAW FOR X****COMMUTATIVE LAW OF X** | **Multiplication tables****ITP Multiplication board** |
| **ADJUSTMENT (COMPENSATION)** | **19 X 13 = 20 X 13 – 13****= 260 – 13****= 247** | **PLACE VALUE** **ROUNDING** | **Arrays** |

**Written Methods of Addition**

**Written Methods of Subtraction**

**Written Methods of Multiplication**

**Written Methods of Division**

**Assessment of Progression in Calculation**

At St Michael and All Angels we strive to use accurate and consistent assessment strategies to ensure the progression and achievement of all children from Foundation Stage to Year 6. In maths, all teachers will adhere to the agreed assessment policy and format for calculation to ensure consistency across the school.