Maths

“The answer is only the beginning.”

Schleppenbach *et al,* 2007

Rationale

Mathematics helps us to make sense of our world. It is a powerful, universal language used to explain, predict and represent events and tackle everyday problems. Mathematics is of central importance to our modern society. It is an essential part of everyone’s daily life and critical to science, technology, finance and engineering. Mathematics is necessary for any employment or independent life.

The aims of our maths teaching at Broughton Fields Primary School are aligned with the aims of the National Curriculum: **fluency, reasoning** and **problem solving** – both in the mathematics lesson and across the curriculum. We recognise that pupils need to learn basic number facts and acquire **fluency in procedures**, alongside **developing conceptual understanding** if they are to be able to solve increasingly complex problems in life and later in the workplace. “The answer is only the beginning” captures our aim to teach children that maths is much more than an answer or a method. We want to teach our pupils to understand the mathematical concepts that they are working with, to explain why a concept works, or why a particular method works and to be able to confidently solve problems, reason, identify patterns, explain strategies, debate solutions, etc.

We have adopted a **mastery approach** to the teaching of mathematics, so we have high expectations of all our pupils. We endeavour to make the mathematics curriculum accessible to all pupils; moving them through the programme of study at broadly the same pace, with opportunities to work on the objectives more deeply for those who rapidly grasp concepts. All children need a deep understanding of the mathematics they are learning in order that future learning is built upon firm foundations.

Part of this approach includes adopting a ‘**growth mind-set’**. Children at Broughton Fields are encouraged to believe they are all capable of learning and doing mathematics, given sufficient time, quality teaching, appropriate resources and the motivation.

There are aspects of mathematics teaching which will be seen in every classroom at Broughton Fields:

- A positive attitude toward and sense of excitement about mathematics
- All children learn through active enquiry and experiment using concrete materials, representing their mathematical ideas through images and follow a clear progression toward recording abstractly
- Children learn to use multiple representations which ensures depth of understanding
- Mathematical skills are practised and applied across the curriculum
- A mathematically rich environment supports learning
- Communication, using precise mathematical language is an expectation
- Independence is encouraged
- Fluency and flexibility features strongly in every lesson
- Adults use skilful questioning to reveal, probe and address misconceptions
- Children who grasp concepts rapidly are challenged to work more deeply through completion on rich and sophisticated problems
- Scaffolding is provided for children when required

- Skilful assessment identifies children who are struggling to grasp concepts leading to guided groups and catch up sessions, with Teaching Assistants deployed to provide same day catch up.
- Use of high quality resources enable all pupils to deepen their understanding of mathematical concepts; in order to be challenged

The Classroom Environment:

The classroom environment should be mathematically rich and support current learning.

Maths working walls are a used daily as a part of the maths lesson and so must be clearly visible and interactive. Key vocabulary, 'Buzz words', reference to the models and images that the children have been working with during the lesson, links to other areas of mathematics and sentence stems should all be included. Purposely planned concrete materials should be available for all pupils to access to represent mathematical concepts. Other useful materials are always available for everyday reference such as Numicon, dienes, Maths dictionaries' and number squares.

Precise Mathematical Language:

The quality of children's mathematical reasoning and conceptual understanding is significantly enhanced if they are consistently expected to use **correct mathematical terminology** (e.g. saying 'digit' rather than 'number') and to explain their mathematical thinking in complete sentences. Teachers expect pupils to use full sentences when answering a mathematical question. If a pupil does not use a full sentence, they may be asked to answer again or another pupil may be asked to build on the response by using a full sentence. The children in the class may then be asked to repeat the sentence in chorus.

I say, you say, you say, you say, we all say
This technique enables the teacher to provide a sentence stem for children to communicate their ideas with **mathematical precision and clarity.** These sentence structures often express key conceptual ideas or generalities and provide a framework to embed conceptual knowledge and build understanding. Similarly, children are encouraged to chant when a mathematical generalisation or "rule" emerges within a lesson. This is repeated in chorus using the same sentence, which helps to embed the concept.

Teaching and Learning:

Lessons are structured around the concrete – pictorial –abstract approach providing opportunities throughout for using mathematical vocabulary, developing mathematical thinking and using multiple representations. Teaching is episodic, enabling misconceptions to be addressed and learning to be effectively moved on where pupils have demonstrated a deep understanding. '**Prove its'** are embedded as one strategy to ascertain the pupils' understanding of mathematical concepts. This avoids pupils being unnecessarily involved in activities and teaching inputs where they have already grasped a particular concept. Instead, teachers and teaching assistants are deployed to provide deepening challenges for these pupils.

The main teaching activity is primarily whole-class based with everyone covering the same content. Children are taught in classes, not setting groups in line with the mastery approach. Lessons are structured with assessment opportunities throughout. This provides opportunities to evaluate what has been learnt, review success and address misconceptions. It also provides opportunity for peer/self-assessment so children understand what they have attained and where to go next. There are no specific time limits for the different parts of a lesson. Lessons are planned as a series in order to provide the sufficient time needed for pupils to **explore, clarify, practise and apply** concepts. As such, individual lessons may be a continuation along a particular learning intention. Individual lessons do not follow a rigid structure and it may not be necessary for a whole-class input where, for example, children are practising a skill or solving deep mathematical problems which requires the time to do so.

The aim of a mathematics lesson is to teach a skill or strategy that will provide a solution to a task. It is not simply to produce a page of correct number work, which is abstract to any real life situation. Deep learning

opportunities are planned in advance, so that a pupil can be moved onto more challenging tasks during a lesson, having demonstrated their understanding through a fluency, reasoning or problem solving task.

Although maths is taught as a discrete subject, staff are encouraged to exploit any cross-curricular links and provide opportunities for children to demonstrate their mastery of concepts or skills in other subjects (eg: science, ICT, PE, Humanities).

Times Tables:

A consistent whole-school approach to teaching times tables has been established so that all pupils will know their multiplication and division facts up to 12x12 by the end of Year 4.

Year Group	Times Tables to master
Foundation	1x 2x- halves
Yr1	Continue 1x 2x 10x 5x 4x (Double 2s)
Yr2	Consolidate all of the above 8x (Double 4s) 3x
Yr3	6x (Double 3s) 12x (Double 6s) 9x
Yr4	7x 11x
Yr5	Immerse in the facts – pictograms, fractions, etc.
Yr6	Immerse in the facts – pictograms, fractions, etc.

Rolling numbers, times tables songs and daily chanting with the counting stick have been embedded in all classes. All classes have access to, and are expected to make use of, TT Rockstars to ensure consistency between year groups and ensure that multiplication and division facts have been mastered. TT Rockstars also mirrors the structure of the Government Times Tables check, and so this will ensure our pupils are effectively prepared for this assessment. The on-going assessment of these multiplication and division facts will sit alongside the 'Learn its' assessments.

Calculation Strategies:

Pupils are taught to use efficient mental strategies to solve calculations. Written calculations are taught to enable pupils to solve more complex calculations, in which, a formal written method will get to the answer more efficiently. Where these are taught, pupils explore the written calculations practically and pictorially so as to ensure that they fully understand the written method. **Written methods are not taught to the pupils without ensuring that their understanding of place value is secure and that they can articulate their understanding when using a formal written method to explain this strategy.** Pupils are challenged to show depth by solving problems including finding missing digits in a written calculation and reasoning about a written calculation, to explain why it is correct or incorrect for example.

Below *(Figure 1.1)*, the progression of calculations taught in each year group have been defined. However, a child is not prevented from using a more sophisticated method where it is evident that they are competent to do so and that they have demonstrated an understanding of the mathematics behind the method. For example, if a child in Year 3 is using column multiplication, they will not be required to use the grid method instead if they are able to explain their calculating and demonstrate a depth of understanding by using the method to solve complex problems.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on. Regrouping to make 10.	Adding three single digits. Column method – no regrouping.	Column method- regrouping. (up to 3 digits)	Column method- regrouping. (up to 4 digits)	Column method- regrouping. (with more than 4 digits) (Decimals- with the same amount of decimal places)	Column method- regrouping. (Decimals- with different amounts of decimal places)
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10	Counting back Find the difference Part whole model Make 10 Column method- no regrouping	Column method with regrouping. (up to 3 digits)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. (with more than 4 digits) (Decimals- with the same amount of decimal places)	Column method with regrouping. (Decimals- with different amounts of decimal places)
Multiplication	Doubling Counting in multiples Arrays (with support)	Doubling Counting in multiples Repeated addition Arrays- showing commutative multiplication	Counting in multiples Repeated addition Arrays- showing commutative multiplication Grid method	Column multiplication (2 and 3 digit multiplied by 1 digit)	Column multiplication (up to 4 digit numbers multiplied by 1 or 2 digits)	Column multiplication (multi digit up to 4 digits by a 2 digit number)
Division	Sharing objects into groups Division as grouping	Division as grouping Division within arrays	Division within arrays Division with a remainder Short division (2 digits by 1 digit- concrete and pictorial)	Division within arrays Division with a remainder Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number interpret remainders appropriately for the context)	Short division Long division (up to 4 digits by a 2 digit number- interpret remainders as whole numbers, fractions or round)

Figure 1.1 *Whole school progression in calculation*