

Yorke Mead Primary School

Mathematics Policy

January 2017



Our School Vision Statement

BRINGING LEARNING to LIFE

We are a school dedicated to creating an environment where children are able to grow into happy, well-rounded individuals with a love of learning through which they can achieve to the best of their abilities.

We want our pupils to enter the wider world as

- o Happy, positive individuals*
- o Responsible citizens who make a positive contribution*
- o Confident, resilient, healthy & life-long learners.*

DARE TO...

D - Determination

A - Ambition

R - Resilience

E – Enjoyment

T - Trust

O - Openness

WHAT IS MATHEMATICS?

Mathematics is a creative and highly inter-connective discipline that is essential to everyday life. It involves the search for, and the study of, patterns & relationships.

Mathematics is crucial to a child's understanding of the way the world is ordered. It is a means of communicating information and ideas. It is also a creative activity, involving imagination, intuition & discovery. It is essential for all pupils whatever their ability.

Being a mathematician involves much more than learning facts, skills and methods to tackle calculations. It involves exploring and investigating mathematical systems and operating these systems in order to find out more about them. It involves applying knowledge, skills and understanding to solve problems about a variety of contexts.

The New Curriculum aims state that:

"Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects."

By adopting a whole school approach to the learning and teaching of mathematics across our school we aim to:

- Provide consistency in the same high standards across the whole school and agreement on expectations.
- Enable children to learn mathematics as efficiently as possible.
- Enable staff to teach and facilitate learning in mathematics as efficiently as possible.
- Give children the mathematic skills they require to be life-long learners.
- Provide an inclusive environment for all children built on quality first teaching.
- Learn from each other, through the adoption of a collaborative enquiry based approach to teaching and learning, where good practice is shared.

All our teaching is underpinned by the confidence that every learner can improve and that making mistakes and being stuck or 'in the pit' is a necessary and natural phase of new learning.

Aims (Embracing the New Curriculum)

The new National Curriculum for Mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately;
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language;
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Using the Programmes of Study from the National Curriculum 2014 for the teaching of Mathematics at Yorke Mead we aim to:

- Ensure all children become fluent in the fundamentals of mathematics so that they develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- Involve all children in their learning and to give them a sense of achievement, positive attitude towards mathematics and an awareness of the fascination of mathematics.
- Provide a positive and supportive learning environment in which all children can enjoy their mathematics and feel able to rise to the challenge of developing competence and confidence in their mathematical knowledge, concepts and skills.
- Develop in children an ability to reason mathematically following lines of enquiry and to use their mathematical knowledge & skills to solve problems, to reason, to think logically, working systematically and accurately and to develop a mathematical argument or proof using mathematical language.
- Enable children to be able to communicate their mathematical understanding, explaining their reasoning to others both orally and on paper.
- Develop in children an ability to use & apply their mathematics across the curriculum and in real life.
- Develop an understanding of mathematics through the process of enquiry and experimentation.

NB: This policy should be read in conjunction with the School Calculation Policy and the school Teaching & Learning Policy

Mathematical Fluency

The National Curriculum aims to ensure that all pupils become fluent in the fundamentals of mathematics so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

Rote memorization of basic facts is not fluency. Mental fluency involves the ready use of adaptive strategies across a variety of contexts. Pupils without adaptive fluency at their fingertips spend longer determining routine answers and less time on meaningful application slowing their overall progress in mathematics.

Being mathematically fluent goes beyond simply knowing number facts or definitions; to be truly mathematically fluent involves choosing methods and procedures and working flexibly.

Key Stages of Mathematical Fluency Development

If children are to develop mathematical fluency it is important they develop a strong number sense. We believe that it is important that in the early development of their mathematics children focus on developing this number sense. In Early Years and Key Stage 1 our focus is on children working with numbers in order to achieve this working with three main foci:

- **Subitising of Numbers**
This involves the ability to instantly recognise the number of objects in a small group without the need to count them (e.g. dot patterns on a dice, patterns on dominoes etc.). It is important for children in key stage 1 to learn that numbers are made up of other numbers as this develops the understanding of number relations and makes it possible for children to think about numbers with flexibility.
- **Number Magnitude**
This involves understanding about a numbers place within our number systems. To have developed number magnitude a child will be able to consider numbers and the size of these

numbers in relation to each other. They will be able to use all they know about numbers to begin to visualize numbers and their positions on number lines/ scales even when the numbers are not there.

- **Development of Calculation Strategies and Recall of Core Facts**

In KS1 this means it is important for children to practice and over practice the core facts – number bonds, counting up & back in different amounts, halves and doubles

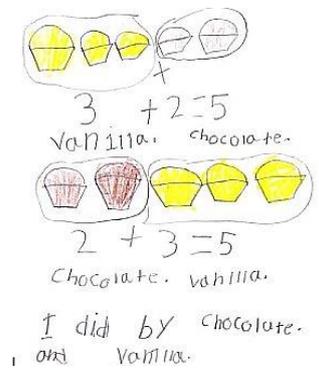
Developing an understanding of Mathematics – from concrete to abstract.

Liebeck (How Children Learn Mathematics) reminded educators of the essence of children developing both calculation competence and mathematical understanding. To solve real problems we need to understand mathematics. Paradoxically, to understand mathematics, we need to solve real problems. The importance of children being able to play and explore their mathematics with real objects, in real situations, is a key element of mathematics at Yorke Mead.

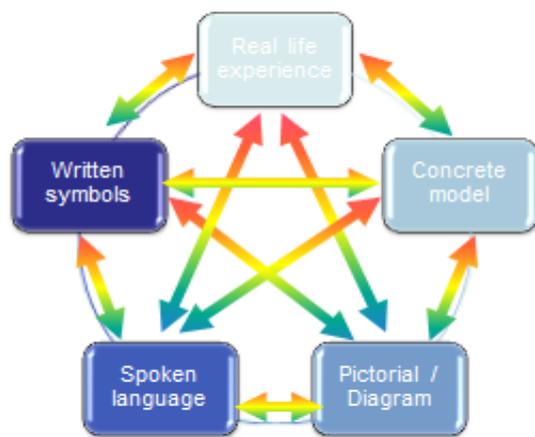
As children develop mathematically they need to take the essential steps from the concrete to the abstract. At Yorke Mead we believe that at all stages of children’s mathematical development, from Early Years to Year 6, this is achieved in the same way. Children need to progress through a sequence of abstraction.

This sequence is categorised as:

- E - EXPERIENCE** with physical objects
- L – Spoken LANGUAGE** that describes that experience
- P- PICTURES** that represent the experiences
- S- Written SYMBOLS** that generalise the experience
- ELPS –Throughout this policy this will be referred to as ELPS**



Multi representation



It is not the type of representation that is indicative of the child's understanding, but the ability to 'translate' between these models.

At Yorke Mead Primary School mathematics is taught to all pupils throughout the school using the ELPS sequence. Whilst this is a sequence, the connections between elements at all levels are essential

as indicated by the representation above. As when a pupil is able to use all elements of multi – representation then they will have truly mastered the learning.

At Yorke Mead it is envisaged that the large majority of pupils will progress through the curriculum content at broadly the same pace, supported as required by materials to allow access to this curriculum content. The ultimate aim is that children will, wherever possible, be taught content from the curriculum expectations outlined for their year group.

We believe that mathematics is a tool for everyday life. It is a way of looking at and making sense of the world using concepts and relationships. It is also used to analyse and communicate information and ideas, to tackle a range of practical tasks and real life problems. Therefore whilst it is taught as a single subject in a daily session, we do strive to make use of cross curricular links wherever possible to enable children to see and use their mathematics in its true sense.

How we learn:

10% of what we **READ**
20% of what we **HEAR**
30% of what we **SEE**
50% of what we **SEE and HEAR**
70% of what is **DISCUSSED** with others
80% of what is **EXPERIENCED PERSONALLY**
95% of what we **TEACH TO SOMEONE ELSE**

William Glasser

Explaining the Depth and Breadth (Mastery) Approach to Teaching Mathematics in our School

What our school is doing to move towards a mastery approach

Using the core content from the Programmes of Study, we aim to provide children with deeper knowledge and understanding of mathematical procedures and related concepts. As such the school is/has identified the key learning for each year group/age range and supports teachers to plan to secure these. Learning sequences are developmental and, depending on the concept, a good proportion of time will be spent securing key learning. Teachers will use their judgement about when it is the right time to move on. As we secure this approach, it is envisaged that the large majority of pupils will progress through the curriculum content at broadly the same pace

What a visitor might typically see in maths learning in our school

- Whole class direct teaching with clear and progressive modelling of concepts and procedures with sequences of varied examples
- The consistent use of core manipulatives and representations to support ability to access learning and to deepen children's understanding
- Rehearsal of core facts and strategies through the development of frequent 'intelligent rehearsal' (Fluency Feeders)
- Rich mathematical talk is given high status and supported by the learning environment and teachers' questioning

- Emphasis placed on 'learning' through reasoning, developing multiple strategies and concepts towards understanding
- Pupils 'grappling' with learning mathematical concepts
- Challenge for pupils grasping concepts quickly is provided through depth and breadth of experience
- A few areas of learning covered more deeply in an half term
- Daily opportunities to reason and problems solve
- Differentiation is achieved through:
 - adjustments to allow access to whole class learning or
 - increase in challenge through adjustment for depth and breadth to whole class learning.

Schemes of Work

We use no purchased published scheme of work. Our school scheme of work is a working documents composed of ongoing plans on a week by week basis. These plans are developed form the National Curriculum Framework and are adapted to take into consideration the needs of our children. Some teachers also refer to the Teaching Sequences on the Hamilton Trust website to support their planning but again these are adapted to suit the needs of our children.

Cross Curricular Links

Throughout the whole curriculum opportunities arise to extend and support the children mathematical skills. Teachers seek to take advantage of these opportunities to enable the children to see the role mathematics plays in all aspects of both the wider curriculum and in real life activities.

Teachers' Planning and Organisation

Each class teacher is responsible for planning for the mathematical learning in their classroom, working in consultation with their year group partner and the mathematics subject leader.

The approach to the teaching of mathematics within the school is based upon these key principles:

- ✓ ***a mathematics lesson every day***
- ✓ ***a clear focus on developing mathematical fluency with mental calculation; going broader, richer, deeper at each stage before progressing onto higher skills***
- ✓ ***a clear focus on direct, instructional teaching & interactive oral work with the whole class and guided groups***
- ✓ ***an emphasis on & encouraging children to talk about their maths work***

In the Foundation Stage teachers base their objectives to enable the children to work toward the Early Learning goals for Mathematical Development. Children will work individually and in small groups with some whole class discussions. Teachers in Year 1 build upon this work with a whole class introduction and plenary but continuing with small group activities in the Autumn Term. Over the Spring Term teachers in Year 1 draw the elements of a daily maths lesson together so that by the Summer Term in Year 1 children are familiar with the whole class mathematics lesson. The key focus of learning in Year 1 is on a thorough understanding of numbers to 20 and fluency working with these.

In Key Stage 1 the daily mathematics lesson is at least 45 – 50 minutes long, and in Key Stage 2 the lesson lasts around 60 minutes. The lesson is usually in the morning; though where timetabling makes this difficult or opportunity is being taken to explore a cross curricular link there may be occasion for the lesson to take place at other times.

Medium Term Planning is brief and intended to link appropriate units from the Mathematics National Curriculum to allow opportunities for cross curricular links to be developed. Detailed planning is made in the daily lesson plan, which is planned using the common planning format.

A copy of the lesson plan is given to any teaching assistant working with the class in sufficient time for them to be able to read & discuss with the class teacher prior to the lesson. Copies of lesson plans are kept on the school network and an annotated paper copy is kept in the teachers planning file. The mathematics co-ordinator will monitor planning throughout the school.

Super, Mega, Ultra

Planning is generally differentiated to three levels to allow children to work at an appropriate level for their ability. Children are encouraged to choose the level of challenge for themselves depending on their confidence in the task. Staff at Yorke Mead recognize that children may be highly confident in some aspects of mathematics e.g. money yet less sure in other aspects e.g. time. Super, Mega, Ultra challenges allow flexibility in teaching so that children are able to be challenged appropriately in every lesson. Children are encouraged to recognize when a challenge is too easy or too hard and to move between challenges in any lesson as appropriate.

Teachers will monitor the challenges children are choosing and if necessary support and encourage them to choose the right level of challenge. Where teachers feel that groups would benefit learning these are used, any groups are flexible to allow children to be challenged appropriately and respond to day to day assessments.

THE MATHEMATICS LEARNING ENVIRONMENT

At Yorke Mead we aim to create a supportive and positive learning environment where children are appropriately challenged and where all children see themselves as mathematicians.

To support their learning there are the following agreed principles evident in each classroom:

- An **Interactive Maths Board/ Working wall** – where mathematical vocabulary, models & images are displayed as reference and activities are included to support and engage children in their learning.
- **Mathematical Toolkits** to support learning – each classroom is equipped with a range of practical resources to support children in their work. These include counting apparatus, number lines, number squares, calculators etc. Children should know where resources are kept and always feel that they are able to select resources as required to support their work. Some more specific resources are stored in a central maths area for teachers to select when required. **Teachers are focused on teaching children how to access and use practical resources efficiently to support their learning.** Resources should never be simply placed on tables without prior teaching.
- **Thinking time / Talk Partners** – questions when asked should where possible be open to encourage children's thinking skills and children should all get the opportunity to participate. Teachers make use of a variety of methods to ensure all children are involved in mathematical discussions and are encouraged to explain their thinking to others. Lolly sticks enable all children to be actively encouraged to take part in mathematical thinking.
- **Learning Journey** – to help children to understand why they are learning something, and where their learning will be leading to in any one unit of work, teachers will share the units learning journey with the children rather than just the days learning intention. On a day to day basis teachers can then identify where they have reached within the learning journey.
- **Good Mistakes and Being Stuck** – where possible we aim to help children see mistakes as learning opportunities and view these positively. Teachers will praise children who recognise their mistakes and learn from these, 'borrowing mistakes' for others in the class to learn from. Children are also encouraged to see 'being stuck' or 'in the pit' as a key part of learning- teachers will encourage children to use the 5B's to get out of the pit (see teaching & learning policy)

- **Assessing Progress and Involving Children** – at the end of each lesson children in key stage 2 are encouraged to reflect on their learning and comment on this in their books. At the end of units of work teachers will ask children to reflect on the confidence they have against the learning journey for the given unit.

INCLUSION - How the school intervenes swiftly to help those having difficulty to make sure they keep up, and to stretch and deepen the learning of the 'rapid-graspers'

- Teachers work with a focus group each day supporting pupils having difficulty to catch up or deepening understanding for those pupils who have grasped the concept quickly. During this focus group, teachers are constantly assessing next steps and diagnosing misconceptions ready for future planning and teaching. These groups are flexible and based upon pupils' understanding of the current learning as teachers understand that pupils grasp areas of maths at different rates. So, for example, a pupil might find learning an aspect of number difficult but may require challenge in geometric learning
- Teachers make manipulatives available to support and/or challenge conceptual understanding depending on the needs of the pupil
- TAs are well trained and as a result of their increased subject knowledge are able to support groups effectively
- The school invests in early intervention for mathematics. These will be short-term and sharply focussed upon specific needs. Leaders will regularly assesses the impact of these as part of the school monitoring cycle
- Staff understand that stretch and challenge are achieved through increasing opportunities for pupils to work deeply and broadly within each area of mathematics.

SPECIAL EDUCATIONAL NEEDS

Children with SEN are taught within the daily mathematics lesson and are encouraged and supported to take part. Where applicable a child's IEP may incorporate suitable objectives for mathematical development which teachers keep in mind when they are planning work.

Additional support staff, such as teaching assistants, allows a smaller ratio of adults to children. It is not appropriate that SEN children **always** work with support – they also need to be able to work independently, and teachers achieve this by careful and appropriate planning. It is also highly important that teaching assistants work with pupils at all levels and that those who find mathematics the most challenging benefit from more opportunities to work with a teacher.

GIFTED & TALENTED PUPILS

Within the daily mathematics lesson teachers not only need to provide appropriate activities to support children who find mathematics difficult but also activities that provide appropriate challenges for children who are high achievers in mathematics. On occasions a Turbo challenge may be provided to stretch G&T children further if assessment has shown this is required. These turbo challenges are aimed at deepening children's understanding and developing higher level thinking skills. This may involve children proving a mathematical concept in more than one way or investigating generalizations to prove mathematical hypotheses.

ENGLISH AS AN ADDITIONAL LANGUAGE

We incorporate mathematics into a wide range of cross-curricular subjects and seek to take advantage of multi-cultural aspects of mathematics.

In the daily mathematics lesson we support children with English as an additional language in a variety of ways e.g. repeating instructions, emphasising key words, using picture cues, playing mathematical games, encouraging children to join in counting, chanting, finger games, rhymes etc. Children for whom English is an additional language may benefit from Pre-Teach sessions where new mathematical vocabulary is introduced prior to the maths lesson.

GENDER

We aim to encourage all children to see themselves as mathematicians and to strive to achieve their full potential. It may be appropriate at times for a group of same sex children to work together e.g. quiet girls, to encourage them to talk about their mathematics. The Inclusion lead across the school monitors progress of both boys and girls alongside the mathematics leader to ensure any gap is identified and action is taken to reduce this.

PUPILS' RECORDING OF THEIR WORK

It is important that children record aspects of their mathematical investigations. There are occasions when it is appropriate to carry out quick written calculations. Children are taught a variety of methods for recording their work (see school's calculation policy) and they are encouraged & helped to use the most appropriate method of recording.

Children are encouraged to use mental strategies before resorting to written algorithms.

As part of the ELPS process children will be encouraged to work practically with apparatus and orally talking about their maths before they commit to paper. This may be recorded using photographs or on teachers' annotated plans. Initial recording may take the form of pictures before mathematical symbols are used to record maths.

All children are encouraged to work tidily and neatly when recording their mathematics work in their maths books. When using squared paper one square should be used for each digit. Children should be encouraged to cross out errors rather than rubbing these out as these are part of the mathematical process of learning.

It is important however that concern for neatness does not interfere with mathematical thinking. At times to allow children to focus on the mathematics rather than the neatness of work teachers may choose to work on whiteboards or to have a whiteboard or working column down the side of the page where calculations can be trialled. E.g. this may be when a new method is being introduced, in open ended investigative work or for children who are not yet happy committing their methods to paper.

FEEDBACK & MARKING

In marking books teachers at Yorke Mead recognize they are marking for the children, and through written comments at the end of lessons and teachers marking a **strong dialogue** develops between the teacher and the child. Marking should be prompt and timely to enable the formative assessment to feed into the next lesson.

An essential element of this is giving children time to read and respond to the previous days marking at the start of the next lesson.

Work in mathematics can generate a great deal of marking, and it is recognised that it is not always possible or desirable to carry out in depth marking of every piece of work. Work involving routine practice could in the key Stage 2 at times be peer marked with guidance from the teacher and at times

Year 5 and 6 children could be encouraged to check computational work using a calculator. At these times the focus will be on sharing the process or methods used.

The **quality of marking is the crucial factor**. Marking should be diagnostic not just summative. It is best done through conversation with the child but the school acknowledge constraints of time do not always allow this. A simple "x" is of little assistance unless accompanied by an indication of where the error occurred, together with an explanation of what went wrong. If a child has struggled with an activity to see a series of X's will do little to their self- esteem. At such times it is more appropriate that marking is done through a conversation with the child.

Next step / modelling in marking should be used to help children identify where they have a misconception or to move learning on. This approach to marking should not be restricted to only times when a child has struggled – **it should also be used to challenge children further**.

Younger children may struggle to read explanations and teachers may choose to mark work of these children with comments to support assessment, with more immediate feedback being given to the child using stickers or verbal comments.

Children also should have regular opportunities to have a learning conversation about their mathematics with their teacher. These generally take place on a weekly basis for 3-4 children during one of the longer assemblies. This time is used to share approaches to learning and discuss targets for future learning.

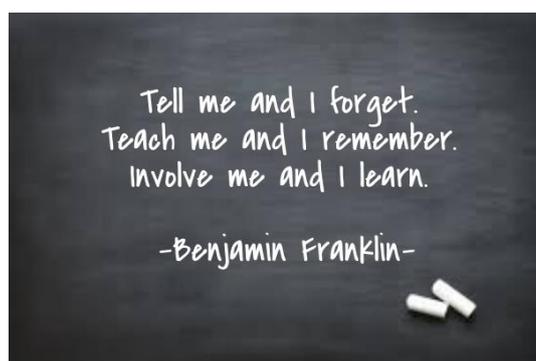
ASSESSMENT & RECORD KEEPING

At Yorke Mead we believe that daily high-quality formative assessment provides the link between teaching and learning.

Each teacher is expected to make regular ongoing assessments of a child's progress to enable them to plan appropriately the next steps of learning. These may be recorded using anecdotal notes on the daily lesson plan, on feedback sheets by a teaching assistant kept by the teacher or as comments in the child's maths book.

In Key Stage 2 children have weekly informal tests of Mental Arithmetic. These are marked with the children so that misconceptions can be corrected and the merits of different methods discussed. Children will also have a weekly time tables test and results from these are sent home so parents can support their children's learning of multiplication tables and associated division facts.

INVOLVING CHILDREN IN THEIR OWN ASSESSMENT & LEARNING



Throughout this policy you will see that children are encouraged to be totally involved in their own learning and assessment. This includes features such as selecting the level of challenge, responding to feedback and marking, assessing their own understanding at the end of a lesson or unit of work. Targets for a unit of work are shared with pupils at the start of a unit and self-assessed by the pupils at the end of a unit.

Where children indicate at the end of their maths work how they feel about the work using smiley faces colour coded with the traffic light system, sad faces are discouraged. Instead a happy red face should reflect a child who is lacking confidence in an area. No child should feel sad about not understanding but should instead see this as a natural stage in their learning of a new skill.

At Yorke Mead in mathematics we carry out the following more formal assessments:

- End of Unit Assessments – at the end of each unit teachers highlight against learning objectives to show the learning that has been achieved. The highlighting is colour coded (orange autumn, yellow spring and green summer) to show the rate of progress
- Assessment Tasks – Using the principles of assessment for learning, we make use of a series of tasks designed for teachers to use within teaching and learning sequences. These help teachers to identify short-term (within the same lesson) and longer-term adaptations and adjustments required for individuals and groups of learners to become more successful.
- Formal Written Tests – In the Spring & Summer Term children in KS2 complete a formal test appropriate to their mathematical ability.

The Senior Management Team track termly each pupil's progress. As part of this each term class teachers meet with the senior leadership team for a Pupil Progress Meeting. The aim of this meeting is to allow reflection on groups of children who are achieving well and what is supporting this, and the identification of pupils whom are not progressing & what may support their progress.

REPORTING TO PARENTS

In the Autumn and Spring Term oral reports are submitted to parents at the parent consultations. Notes of these conversations are recorded on the parent consultation sheet which are signed by both teacher and parent, and at the end of the year are passed to the next teacher.

Written reports are completed before the end of the summer term and parents are given opportunity to discuss their child's if they wish to.

Teachers use the information gathered from their ongoing assessment processes to help them comment on individual children's progress.