

## Hemlington Hall Academy Maths Strategy



***'The only way to learning Maths is to do Maths'***

*Paul Halmos*

At Hemlington Hall Academy, Mathematics is a creative and enjoyable subject. We strongly believe that Maths is essential to everyday life, it is critical to Science, Technology and Engineering, and provides children with life skills needed in the wider world after leaving primary education and beyond. With this in mind, we offer our children at Hemlington Hall Academy a high-quality Mathematics education which provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of Mathematics, and a sense of love, enjoyment and curiosity for the subject.

### *Intent*

- All children to be fluent, brave and logical mathematicians who display a love for the subject and understand its 'real life' value – our golden thread.
- That children become 'elegant' mathematicians: children are able to manipulate and transfer their knowledge, being able to calculate and solve problems in the most efficient way. Always starting from "What do I see? What do I notice? What do I know?"
- All children will be secure in the key age related content ensuring they are able to build learning progressively from year to year. Children will be 'key stage ready'.
- We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking the approach of understanding concrete, pictorial representations first to support children's abstract methods.
- Our Maths curriculum is designed so that children have ample opportunity for repeated practise of skills and facts so that children know more and remember more i.e. make progress.
- At Hemlington Hall Academy, our Maths curriculum is designed to underpin the mathematical demands within the Science Curriculum. Our Science curriculum (STEM Learning Solutions) is fully aligned to the objectives in the Maths curriculum and the skills taught support children's understanding of what is happening (LKS2) and why it is happening (UKS).
- To use the outdoor environment effectively to bring mathematical concepts to life.
- To use data effectively to support children's next steps in learning and to address any refinements needed to curriculum content and plans.

Fluency is key to becoming a successful mathematician. It is for this reason that we ensure children work from a basic understanding of fluency to varied fluency before tackling problem-solving. We have a structured, whole school approach to problem-solving once children have mastered the underlying content of an area of Maths. Our pedagogical approach to teaching mathematics provides a platform for oracy: lessons are reasoning-rich learning experiences for children, with reasoning and discussion throughout to ensure children are thinking deeply about their learning.

### *Implementation*

Hemlington Hall Academy's Maths curriculum is based on 'the five big ideas for teaching mastery'. Our curriculum embeds coherence, representation and structure, mathematical thinking, fluency and variation in order for all pupils to develop a deep and connected understanding of mathematic concepts that can be applied

in a range of contexts. There will be several variations of the same and related content to facilitate children's overlearning, varied fluency and confidence in mathematical concepts. We will 'over-teach' concepts, in the core areas of: number and place value, the four operations, times table and division facts.

- Our Pupils are taught through whole-class interactive teaching, where the focus is on all pupils working together on the same lesson content at the same time. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind. As much of the learning happens through talk, mixed ability setting is a key expectation at our school.
- More importantly, as all children work on the same task, children are not categorised as being lower or higher ability. Pupil confidence and a joy of mathematics will grow.
- If a pupil fails to grasp a concept or procedure, this is identified quickly and early intervention ensures the pupil is ready to move forward with the whole class in the next lesson. Intervention will be in the form of rapid response(RR), pre-teaching and catch up sessions, based on specific issues and content.
- From Year R, in addition to a daily mathematics lesson, children will also experience a daily short mental fluency lesson – based upon subitising, counting, number facts, relationships and calculations.
- Key facts such as multiplication tables and addition and subtraction facts within 20 are learnt automatically to avoid cognitive overload in the working memory and enable pupils to focus on new concepts.
- From Y3, every morning, before registration, the children will practise their prior learning (Give Me 5) to afford daily recall opportunities. We believe that daily retrieval practice of important taught concepts will strengthen the neural pathways and aid retention of learning. The prior learning will come from yesterday, last week, last term, last year and in preparation for maths in another subject e.g. data handling in a science lesson.
- Challenge is present in all our lessons: targeted questioning, deepening challenges and stretch opportunities. We aim to deepen knowledge by asking children to apply their knowledge in different ways, providing opportunities for children to tackle problems and find several solutions to calculate the same problem/concept.
- Children are taught conceptually through problem-solving contexts, which are initially linked to real-life situations and real objects that they can manipulate. Pupils start by being able to understand and relate to the questions in a 'concrete' method. As the pupil progresses in their understanding, the context is then represented in a 'pictorial' state (actual pictures of the objects at first, then later moving onto more abstract representations like bar models). The final stage, 'abstract' refers to the more formal methods of calculations such as column multiplication or the bus-stop method.
- Carefully chosen manipulatives and representations will be used to teach all mathematic concepts not forgetting that they are a temporary scaffold until independence is achieved.
- Through teacher facilitation, expert questioning, deepening challenges and peer discussions, all children are challenged at their level. Communication is a vital part of this process and is threaded through our Oracy curriculum. It is through peer discussion, and the proving and disproving of ideas, that metacognition happens (being aware of one's thought processes). This enables greater depth of understanding.
- Together, we're building a whole new culture of deep understanding, confidence and competence in Mathematics. A culture that produces strong, secure learning and real progress. No matter what their starting points, we help all of our children to achieve excellence. The movement towards a mastery vision includes regular and robust assessment which gives clear indicators as to what progress children have made, the concepts children have mastered and what the next steps in their learning will be.

Our mastery approach allows children to:

- Develop a positive attitude towards mathematics.
- Develop their resilience when faced with the unknown and therefore develop a growth mind-set as opposed to fixed.
- Make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems.
- Be curious, explore patterns and explain their reasoning through rich mathematical discussion with their peers.
- Find a more 'elegant' way of solving a problem.
- Build up a wide range of mathematical vocabulary to use across all subject areas.

Our mathematics planning includes:

- Trust Progression in Maths (in line with National Curriculum)
- Lingfield Trust Maths Curriculum (long term and medium term planning from Nursery – Year 6)
- Mental Maths Calculation Policy
- Times Tables Strategy
- Reasoning and problem Solving Progression
- Lingfield Trust's 25 key objectives, Early Years maths curriculum
- Weekly plan includes: Daily focus (small steps), counting/arithmetic focus, key vocabulary, key questions, stretch opportunities, prior learning (previous year), end of year expectations
- Weekly mental maths/arithmetic tests to practise and support automaticity of key facts, taught concepts, identify misconceptions, address in gaps in learning.

#### *Children with SEND within the Maths Mastery Curriculum Approach*

Our Maths Mastery Curriculum Approach is designed to give all learners, particularly the most disadvantaged and those with special educational needs and/or disabilities (SEND) or high needs, the knowledge and cultural capital they need to succeed in life. We believe that everyone, no matter what their starting point is, can learn and improve at Maths. This will clearly depend on individuals' needs. We need to remember also that children with SEND are not always low attainers, so for some it will be the usual curriculum with additional resources suitable for meeting their particular needs. Our school uses PIVATs. Identified children will use these small steps to ensure progress is made and children feel that sense of achievement within the subject. We ensure that if a SEND pupil is working below, at or above the expected standard they are given the appropriate support and resources needed to ensure they reach their full learning potential, and wherever possible, catch up to their peers over time..

#### *Children who are More-Able within the Maths Mastery Curriculum Approach*

Children who consistently work at greater depth can:

- Work confidently and independently.
- Deal with increases in complexity, deduction and reasoning.
- Ask their own mathematical questions and follow their own lines of enquiry.
- Develop a real love and understanding of the subject.
- Very rarely be phased when they solve problems where the concept remains intact whilst changing the context.
- Apply their knowledge consistently, confidently and fluently in one area of a subject to another.
- Be able to explain what they have been doing to others, including teaching other children what they have learned.

## *A Curriculum for All*




## Number Sense – Developing fact fluency and maintaining it.

Making sense of number and being fluent in number facts from an early stage is hugely important in providing a solid base for future mathematical learning. Our nursery curriculum is rich in providing children daily experiences to subitise, exploring everyday maths in the world around to really embed the oneness of one, the twoness of two etc. in order to fulfil the nursery intent to become a mathematical wizard. From Reception through to Year 3, we follow the Number Sense program which aims to stop children being reliant on counting on their fingers to calculate and enable children to develop both a deep understanding of number and number relationships, and fluency in addition and subtraction facts. Children receive a daily diet of Number Sense and in year 3 it is used as an intervention. By the end of the Number Sense program, all children should understand how to use the key strategies to recall addition and subtraction facts fluently and have the ability to apply these strategies when solving more complex calculations and problems. The strategies covered are:

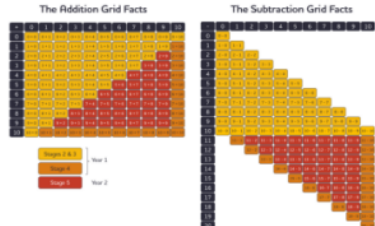
- One More, One Less
- Two More, Two Less: Think Odds and Evens
- Number 10 Fact Families
- Five and A Bit
- Know About 0
- Doubles and Near Doubles
- Number Neighbours: Spot the Difference
- 7 Tree 9 Square
- Ten and A Bit
- Make 10 and Then

These strategies are used throughout school and are displayed in each class so that children use these throughout their school years in order to build on automaticity of facts. From Year 1 to Year 5, children are tested half-termly so that teachers can identify gaps in children's number sense. These half-termly tests provide a low stakes opportunity for children to develop the instant recall at speed. In Year 6, all Number Sense skills are taught, practised and tested through daily maths lessons and weekly arithmetic tests. Children use NumBots app in all year groups to provide fun, low stakes and repetitive rehearsal of the addition and subtraction facts.

### Reception Number Sense Overview

	<p>Books 1 – 5 focus on subitising. The word subitising comes from the root word 'subitus' meaning suddenly, and is the ability to quickly recognise how many items are in sets of up to 4 or 5 without counting. We are born with the ability to subitise, so starting with a focus on subitising is something that is accessible to all children, regardless of prior experience.</p> <p>The programme books sequentially introduce quantities to five, and provide guidance on how to support children to subitise these quantities. As we can only subitise up to 4 or 5 randomly arranged items, quantities above this amount need to be organised into a recognisable structure for us to subitise them, for example the six dice pattern. For this reason, Book 4 and 5 introduce and develop the use of structured mathematical models and arrangements, such as the five frame and ten frame.</p>
	<p>These books continue to develop children's subitising skills, but rather than focusing just on the whole quantities in the way books 1 – 5 do, they start to focus on splitting up quantities into parts.</p> <p>The Early Learning Goal states that children should automatically recall number bonds up to five and some number bonds to 10. These books support children to do just that. They provide lots of contexts and prompts for partitioning sets, and building strong visual models of each quantity which support children to know the bonds within each number.</p>
	<p>Books on partitioning 6 – 9 are not provided in the previous section as children are not expected to know number bonds for these. However Book 11 supports children to understand more about the composition of these numbers, and to develop a deep understanding of them.</p> <p>By the time children get to Book 12, they will already have a deep understanding of numbers to 10, and have had lots of discussions which involve comparing them. This book pulls together that learning to provide focused resources on comparison.</p> <p>Book 13, patterns in numbers to 10, supports children to learn more about the structure of odd and even numbers, and of doubles, including supporting the recall of some doubles facts as required by the Early Learning Goal</p>

## Year 1 – Year 3 Number Sense Overview

Stage	Year	Focus of stage	Mapping to the grid facts
Stage 1 Visual Number Foundations	Year 1	<ul style="list-style-type: none"> <li>Building a deep and visual understanding of numbers 1-10</li> <li>Subitising quantities 1 – 5, and subitising structured arrangements for quantities 6-10</li> <li>Recognising quantities 1-10 twos-wise and fives-wise on tens frames</li> </ul> <b>ASSESSMENT CHECK POINT – NUMBERS 1-10</b>	Preparation for meeting the grid facts
Stage 2 Make and Break Numbers to 10		<ul style="list-style-type: none"> <li>Exploring the different ways that every number to 10 can be broken into parts and put back together</li> <li>Starting to remember some facts</li> <li>Introducing addition and subtraction equations</li> </ul>	
Stage 3 Facts and Strategies within 10		<ul style="list-style-type: none"> <li>Learning calculation strategies for adding and subtracting within 10</li> <li>Learning to use what you know to work out what you don't yet know</li> <li>Achieving fluency in addition and subtraction facts within 10</li> </ul> <b>ASSESSMENT CHECK POINT – FACTS WITHIN 10</b>	
Stage 4 Ten and A Bit	Year 2	<ul style="list-style-type: none"> <li>Building a deep and visual understanding of the numbers and quantities 11 to 20</li> <li>Understanding the concept of place value</li> <li>Learning the Ten and A Bit calculation strategy</li> </ul> <b>ASSESSMENT CHECK POINT – TEN AND A BIT FACTS</b>	Achieving fluency in the grid facts 
Stage 5 Facts and Strategies across 10		<ul style="list-style-type: none"> <li>Learning the remaining calculation strategies</li> <li>Practicing strategy selection to promote efficient and flexible thinking</li> <li>Achieving fluency in addition and subtraction facts across 10</li> </ul> <b>ASSESSMENT CHECK POINT – FACTS ACROSS 10</b>	
Stage 6 Extending Facts and Strategies		<ul style="list-style-type: none"> <li>Learning to extend and apply the within and across 10 facts to addition and subtraction calculations involving 2-digit numbers</li> </ul>	
Consolidation	Year 3 Autumn Term	<ul style="list-style-type: none"> <li>Reviewing and consolidating Stage 5 and 6 to secure fluency in facts across 10 and in mental 2 digit calculation</li> </ul>	Extending the grid facts to other calculations

### *Multiplication Tables Teaching and Expectations*

The automaticity of multiplication and division facts (x tables) are an essential skill for children. The ability to instantly recall these facts enables children to answer relative questions with ease. Therefore, it is important that we approach the teaching and testing of times tables in a similar and progressive format from Y2 to Y6. However, we embed counting in steps from EYFS, to enable our children to be times-table ready!

End of Year Expectations:

Tables Expectations				
Year 1	Year 2	Year 3	Year 4	Year 5
x2 counting steps x10 counting steps x5 counting steps	x2 x10 x5	x2 x10 x5 x4 x8 x3 x6	recap: x2, x4, x8, x3, x6 x9 x7 x11 x12 x squares	weekly mixed retrieval and recall of all table facts

Children are given the opportunity to develop a deep understanding of each fact through a three-week, sequenced lesson plan that allows children to have a deep understanding of each fact with continued rehearsal of old facts.

Daily Times Tables Lesson in Year 3 and 4

(Spring Term in Year 2)



Table Fact	Draw an array
Language	Repeated Addition
Commutative Property	Distributive Property
Division Facts (Inverse)	Applied Facts

KS2 children will access 'Times Table Rock Stars'(TTRS) which is a carefully sequenced programme of daily times tables practice both in school and at home. Staff carefully monitor heat maps of what children know and plan accordingly to further teach unknown facts.

### *Progression in Mathematics*

The Trust has designed this document to ensure that mathematics is progressive across the curriculum, from an exemplification of the Early Learning Goals from our 'Trust Ready' curriculum through to Year 6 expectations. From Year 1 onwards, individual strands of National Curriculum Mathematics are mapped across the year groups, so teachers can see prior learning expectations and the foundations of their current curricula. In addition to this, staff identify on their weekly planning document prior learning in relation to the maths focus. This enables teachers to see what has been retained or any gaps in learning.

### *Early Mathematics*

We believe that all children 'can do' mathematics and developing a sound understanding of mathematics when young is essential. EYFS staff will nurture positive attitudes and help children to build confidence. Self-regulation and metacognitive skills are seen to be crucial for success therefore the development of these skills will be paramount in Autumn term. We want all of our children to develop a growth mind-set from an early age as opposed to a fixed mind-set. It is important to remember that children's early mathematical understanding is strongly associated with their later school achievement. The teaching of mathematics will build upon what children already know and can do. Young children learn best when they are interested therefore we will teach maths through stories, songs, rhymes, board games and carefully chosen computer programmes. Developmental progressions will be used in-line with the new Early Learning Goals, Master the Curriculum, Development Matters and the Trust Ready EYFS curriculum. We want our children to achieve a mastery level, in relation to recognising and understanding numbers, quantity and patterns. Further, we want them all to have 'number sense' and the ability to subitise. This will be important to ensure children have the confidence and strong grasp of basic numbers in preparation for Key Stage One. Our pedagogical approach has been transformed by our investment in Karen Wielding's approach to Teaching Essential Number Sense. EYFS staff understand the importance of the 5 counting principles:

- the one-to one principal
- the stable order principal
- the cardinal principal
- the abstraction principal
- the order irrelevance principal

- The staff will also understand the developmental stages (see appendix – Progression Early Mathematics). Carefully chosen manipulatives and representations will be used to teach all mathematics concepts. Discussion will be encouraged through talk partners and age appropriate mathematical vocabulary will be expected. We will insist upon the accurate pronunciation of number names as well as accurate number formation. The classroom will provide many opportunities for the children to play with and secure their understanding of number, shapes and measures not forgetting to provide both challenge and support as required.

### *Mathematics across the Curriculum*

- Mathematics at our school will ensure that our children are 'ready for life'. Throughout the primary years, children will be given the opportunity to use and apply mathematical skills in other areas of the curriculum. This will enable them to see how maths is used in the real world. Teachers will carefully identify where prior learning (previous year, term, week) can be practised e.g data handling in science, measures in DT, PE and so on. It is important to remember that new skills are learned in a mathematics lesson and practised in other areas of the curriculum.

### *Outdoor Learning*

- We expect teachers to take maths outdoors wherever possible. In addition to making the subject fun and real, outside learning also provides opportunities to:
- Access concrete materials – children need to feel and move around objects to help develop mathematical concepts. Natural treasures such as sticks, stones, seed pods and so on are brilliant materials to support counting, measurement, comparison and so on.
- Develop pictorial understanding – This involves being able to represent concepts through drawing pictures, diagrams, charts and more. Outside learning means that children can experience this in 3D and from all angles, which promotes their pictorial representation and the spatial imagery needed for geometry.
- Understand language and mathematical symbols – concepts such as bigger, smaller, longer, shorter, deeper, shallower, more, less, fewer etc can be practised and better understood with real life experience. Climbing a tree and looking down helps to develop a child's sense of scale and finding something longer than, shorter than, heavier than helps to develop a deep understanding of size and unit.

### *Vocabulary*

We believe that the understanding and use of mathematical vocabulary is key to success. The vocabulary that the children are expected to understand and use is progressive across the mathematics curriculum. The daily focus for vocabulary is identified at the start of each lesson with key vocabulary will be displayed on the working wall. Staff are aware of key vocabulary in terms of that expected of the children and also mathematical terms. (see appendices – Nursery Maths Curriculum and Vocabulary list Reception – Year 6)

### *Assessing Mathematics and Trust Moderation*

At Hemlington Hall Academy, we use the Lingfield Education Trust's 25 objectives to assess children termly and at the end of each year. Within the 25 objectives there are 5 KPIs (Key Performance Indicators) which the children must meet. The KPIs in each year group are focused on the key concepts in the core areas of: number and place value, the four operations, times tables and division facts. At the end of teaching each objective, the Trust's Mini Assessment tests are used to assess the children. Teachers act on the 'So what' and offer further teaching and support on the concept taught for children who are not secure in their learning and application. Pause and Stretch lessons are delivered to all children further opportunity to embed the learning and iron out any misconceptions. Children who have mastered the concept are provided with opportunities to stretch and apply their knowledge with further problem solving to deepen their understanding. In Early Years, teachers use the Early Learning Goals and also follow the Trust Ready Document to assess children termly and at the end of the year. Evidence

will be taken from observations in daily lessons and discussions with the children. Trust-wide moderation takes place to ensure parity of standards are in place. In Year 5 and 6, arithmetic is tested weekly and staff use this information to inform opportunities for teaching and further rehearsal during the Morning 'Give Me 5' starters.

### *Mathematics Homework Expectations*

- The main focus of our maths homework is for the children to practise and refine their mental maths skills (fact fluency). Numbots and TTRS apps are used to support children's learning at home. There are also links on the Maths page of our school website to support further learning at home.

### *The Maths Environment*

A consistent maths environment is vital to ensure that in every classroom, our children have access to what they need to help them learn and retain learning. As such, we have developed a classroom checklist (non-negotiable) to ensure that each classroom has a rich 'Maths Environment'. These expectations are a minimum and teachers are of course free to design their classroom environments as they see fit for their children. Our classrooms will have age appropriate learning prompts to support learning:

- An appropriate number line/ 100 square, number words
- An appropriate place value chart
- Appropriate number facts (number bonds / times tables / division facts etc)
- Key vocab for 4 operations
- Key vocabulary – e.g. shapes and properties, days of week, months of years
- Working wall – showing models and methods, current vocabulary
- A working clock that supports telling the time.

### *Cultural Capital Maths In Today's World*

We will promote a positive message – all children 'can do' Mathematics. There is no such thing as being bad at maths. We will send leaflets of yearly expectations in Autumn Term. We will invite parents into Whole School to celebrate National Number Day and provide activities for everyone to get involved (either in school or through social media). We will always make time to show parents how we do Maths. We will provide engagement activities for parents, training sessions to show them how we use resources and to share our methods of calculation.

- Appendices:
  - 1 Trust's Progression in Mathematics Documentation
  - 2 Medium Term Planning for Mathematics
  - 3 Early Mathematics Progression– Termly expectations
  - 4 Reasoning and Problem Solving Progression
  - 5 Mental Maths Calculation Policy
  - 6 Vocabulary Expectations
  - 7 Assessing Mathematics
  - 8 Classroom Checklist (Outstanding Environment)
  - 9 Trust Calculation Policy

***'An important thing to remember about Mathematics is not to be frightened.'***

***Richard Dawkins***