



Katherine Semar Schools

# MATHEMATICS POLICY

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Katherine Semar Schools

## Mathematics POLICY

### INSPIRE CURRICULUM

At Katherine Semar Schools we have developed the INSPIRE curriculum, which is underpinned by what we believe makes an outstanding curriculum for our children; offering them opportunities to question, be challenged, investigate, experience, communicate, create and understand. Learning is developed in a cross-curricular approach wherever appropriate and the children are given real contexts for their learning which motivate them by creating a genuine purpose for learning.

### OUR AIMS IN MATHEMATICS

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education provides a foundation for understanding the world and the ability to reason mathematically; it is essential to everyday life. These skills will engender a sense of enjoyment and curiosity about the world in which we live.

"Maths is the truly global language. With it, we convey ideas to each other that words can't handle – and bypass our spoken Tower of Babel" (Professor Alison Wolf).

Our aim is to equip all pupils with the skills and confidence to solve a range of problems through fluency with numbers and mathematical reasoning. Children are encouraged to see the mathematics that surrounds them every day and enjoy developing vital life skills in this subject.

In-line with the National Curriculum 2014 we aim to ensure 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.

### OUR INTENT

The intent of our mathematics curriculum is to design a curriculum, which is accessible to all and will maximise the development of every child's ability and academic achievement. We deliver lessons that are creative and engaging. We want children to make rich connections across mathematical ideas to develop **fluency**, mathematical **reasoning** and competence in **solving increasingly sophisticated problems**. Children demonstrate mastery when they can represent concepts or skills in multiple ways, use the correct mathematical language and can independently apply the concept to new problems in unfamiliar situations.

We intend for our pupils to be able to apply their mathematical knowledge across the curriculum and beyond the classroom. We want our children to realise that mathematics has been developed over centuries, providing the

solution to some of history's most intriguing problems. We want them to know that is essential to everyday life, critical to science, technology, engineering, and necessary for financial literacy and most forms of employment.

At Katherine Semar we strive to equip all pupils with the skills and confidence to solve a range of problems through fluency with numbers and mathematical reasoning. As our pupils progress, we want them to have an appreciation of the beauty and power of mathematics; and to have a sense of enjoyment and curiosity about the subject. Children are encouraged to see the mathematics that surrounds them every day and enjoy developing vital life skills in this subject.

## OUR IMPLEMENTATION

We provide opportunities to support pupils to develop a "deep, long-term, secure and adaptable" understanding of the mathematics, mastering one topic securely enough to move on and build on it with another more advanced topic. The children at Katherine Semar work together - the mastery approach involves a whole-class curriculum, without setting by ability. In fact, the focus is to ensure that all pupils can master concepts before moving on, with a "no pupil left behind" philosophy. For pupils who do need further support, they will be provided with additional support, interventions to plug gaps, discussions with parents to ensure continuity at school and home, specialised activities where appropriate.

Following the three main aims of the mathematics National Curriculum, at Katherine Semar:

We will become fluent in the fundamentals of mathematics by:

- Daily teaching of Mathematical concepts, with a minimum of 5 hours study a week.
- Using the calculation and fluency policies to teach an increasingly complex set of skills within a progression of skills.
- Have routines for learning times tables, with regular monitoring of progression.
- Use the Interleaved Practice programme to regularly practice arithmetic (KS2).
- Moving fluently between representations of mathematical ideas. (The programmes of study are, by necessity, organised into apparently distinct domains, but pupils 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).
- Following the CPA approach (Concrete, Pictorial, Abstract).
- Using Singapore models such as the part, part, whole diagram and bar modelling.
- Real-life 'hooks' allowing children to apply their mathematics to real-life contexts and problem solving.
- Identifying, understanding and applying a number of strategies to solve a problem; there is more than one way.
- Allow pupils to identify and select their own chosen methods and equipment which support their learning the best.
- Promote a growth mind-set approach towards their learning – developing a love for mathematics.
- Going deeper and broadening children's learning (instead of moving to next year's curriculum content but digging deeper with a range of activities).
- Use reasoning statements to encourage children to explain their thoughts, processes and understanding.
- Encourage pupils to talk in mixed-ability partners and groups to discuss their mathematical thinking/reasoning.
- Plan conceptual and procedural variation, including non-concepts.
- Allow pupils opportunities to learn from each other and support one another.
- Answer in full sentences – with a focus on using mathematical vocabulary (STEM sentences).
- Using learning walls within every classroom to support pupils learning.

We will become able to reason mathematically by:

- Using mathematics across the wider curriculum. For example: In Computing, using algorithms, promoting logical thinking, abstraction of code etc.
- Using opportunities throughout the day to explore mathematical concepts through problem solving and mathematical games.

- Answering in full sentences.
- Using mathematical reasoning statements.
- Promoting discussion between pupils; working in mixed-ability pairs and groups.
- Promoting enjoyment of learning through practical activity, exploration and discussion through:
  1. Describing – talking through the process of achieving the answer
  2. Explaining – using ‘because’
  3. Convincing – I know this is true/correct/right because ...
  4. Justifying – explores/ delves into deeper maths
  5. Proving – visual and algebraic proof (4 initial categories of proof: Contradiction, exhaustion, logical reasoning, generic proof)

We will solve problems through:

- Applying the mathematical concepts taught in an ELAPS Lesson (Every lesson a Problem Solving Lesson)
- Using examples of problems, including multi-step problems from the NCA statutory tests
- CPA approach; Concrete, Pictorial, Abstract
- The problem solving strategies we will teach are:
  1. Visualisation
  2. Work backwards
  3. Reason logically
  4. Conjecture (can be proved in a watertight way)
  5. Work systematically
  6. Look for patterns
  7. Trial and improvement

## IMPACT

The impact of our mathematics curriculum will lead to outstanding progress over time across all key stages relative to each individual child’s starting point. It is designed to prepare children for their future in and outside of education so they can become successful in whatever they pursue by leaving our school at least at the expected standard for their age. So pupils understand the relevance and importance of what they are learning in relation to real world concepts. Our rich and broad mathematics curriculum aims to make the children enthusiastic about learning mathematics and gain an understanding of its importance in everyday life.

A mathematical concept or skill has been mastered when a child can show it in multiple ways, using the mathematical language to explain their ideas, and can independently apply the concept to new problems in unfamiliar situations.

- Children demonstrate quick recall of facts and procedures. This includes the recollection of the times tables.
- The flexibility and fluidity to move between different contexts and representations of mathematics.
- The ability to recognise relationships and make connections in mathematics.
- Children show confidence in believing that they will achieve.
- Children show a high level of pride in the presentation and understanding of the work
- Children are developing skills in being articulate and are able to reason verbally, pictorially and in written form.
- Children are developing the ability to make connections between mathematical topics.
- Our children are resilient and they make measurable progress against the National Curriculum objectives.
- Well-planned sequences of learning support pupils to develop and refine their maths skills.
- Children show a high level of pride in the presentation and understanding of the work.
- Children are able to independently apply their knowledge to a range of increasingly complex problems.

## Mathematics Mastery Approach

At Katherine Semar Schools we teach mathematics to ensure pupils master the curriculum. This is what you would expect to see within mathematics sessions:

## Mathematics Planning

As a school we have developed our own Katherine Semar Mathematics Curriculum which draws upon the resources and guidance from 'Ready to Progress Materials', 'NCETM Spine Materials' and a selection of schemes and supplements to support the planning, teaching and delivery of our curriculum. Our approach and curriculum continues to be tailored to our Katherine Semar expectations. This is to ensure the learning is tailored to the needs of our children – being supported, scaffolded, extended and challenged further where appropriate. The mathematics planning document has been carefully designed to support teachers when planning their sequence of mastery lessons. Areas considered within our planning include; lesson structure, 10MM activities, conceptual variation, procedural variation, fluency, reasoning, misconceptions, extending learning of the whole class and rapid graspers, supporting learning for those who require additional support, a hook/introduction which is in a real-life context, opportunity to develop conceptual understanding through concrete, pictorial, abstract (CPA) approach, carefully planned modelling and opportunity for children to practise and apply their learning.

## Mathematics Mastery Approach

Over the year, the subject coordinators work with class teachers to support mastery teaching and learning within their classrooms through CPD training, monitoring, planning meetings and any additional support required. This is what you would expect to see within our mathematics sessions:

- **Whole class together** – Our mathematics is taught within mixed ability groups. Occasionally, support and extension groups will work within small groups outside of the classroom with a trained LSA. This is to support and/or extend the children's learning further, ensuring every child is making progress every lesson. Lessons are planned based on formative assessment of what students already know and we include all children in learning mathematical concepts. At the planning stage, teachers consider what scaffolding may be required for children who may struggle to grasp concepts in the lesson and suitable challenge questions for those who may grasp the concepts rapidly.
- **Longer but deeper** – in order to address the aims of the national curriculum, our long/medium term plans have been adjusted to allow longer on topics. Each lesson focus is on one key conceptual idea and connections are made across mathematical topics. It may appear that the pace of the lesson is slower, but progress and understanding is enhanced. Our assessment procedures recognise that the aims of the curriculum cannot be assessed through coverage (ticking many objectives off a list) but through depth within a topic.
- **Key learning points** are identified during planning (collaboratively in year groups) and a clear journey through the maths should be shown within planning and on IWB slides (also reflected on learning walls). Greater depth activities will be planned carefully to ensure rapid graspers learning is stretched and challenged without crossing into future year's curriculum content. **Questions** will probe pupil understanding throughout and responses are expected in full sentences using precise **mathematical vocabulary** (usually displayed on learning walls). Stem sentences may be used to scaffold children's reasoning, vocabulary and understanding.
- **'Misconceptions'** are identified during the planning process and children will be supported through these (also usually displayed on learning walls). We celebrate mistakes to ensure children understand that this is the way we learn. Mistakes are celebrated, addressed and overcome together.
- **Fluency** – We recognise that 'fluency' is not just about remembering facts. Across both schools, you should usually expect to see every mathematics session begin with a starter. These starters will develop aspects of fluency through lessons, by applying them to problems and engaging children into explaining their reasoning. Fluency facts will be taught within lessons to ensure understanding, as well as practised for recall. In all year groups, we have begun to include a separate fluency session where the children are given the opportunity to practise their year group's fluency facts – these will be completed in a range of engaging activities which aim to support the children to have rapid recall of these facts. You will often hear and see the statements: Prove it! Convince me! Each year group have set fluency facts which are outlined in our fluency policy. There is a whole school focus on developing an instant recall of key facts.
- **Exploration** - instead of 'Let me teach you...' as a starting point, children are encouraged to explore a problem themselves to see what they already know. Lesson objectives are not always shared with the children at the beginning of the lesson because sometimes we want the children to reason for themselves. On these occasions, at some point from the middle or even at the end of the lesson, the children will be asked what they've been learning that day. The sessions L.O. will then be shared and discussed with the class. We still ask that the children write a L.O. for each session. Lessons where the L.O. is shared, the class teacher will discuss and explain to the children to ensure they have a clear understanding of their learning focus.

- **Develop reasoning and deepen understanding** (contexts and representations of mathematics) – problems are usually set in real-life contexts - carefully chosen representations (manipulatives and images) are used by all to explore concepts. These representations may often appear in books as children show their understanding, rather than just answers to a series of calculations. The use of practical resources, pictorial representations and recording takes place in every lesson (the CPA approach). Reasoning statements may also be displayed in the classroom to support children answer and writing in full mathematical sentences. At Katherine Semar we believe that a high-quality mathematics education provides a foundation for understanding the world and the ability to reason mathematically; it is essential to everyday life. These skills will engender a sense of enjoyment and curiosity about the world in which we live. “Maths is the truly global language. With it, we convey ideas to each other that words can’t handle – and bypass our spoken Tower of Babel” (Professor Alison Wolf). We share this message with all children with aim to promote the importance and enjoyment of mathematics.

- **Structuring** - the teacher will organise the findings of the exploration, compare/contrast strategies and guide toward the most efficient strategy (or the one being learnt that day).

- **Step by step approach** – journey through the mathematics (these steps may appear small, especially at the beginning of a lesson, there are points when suddenly a jump appears to have been made, or an extra challenge appears – this is normal). The smart notebook/PowerPoints/planning clearly show this step by step approach. In some year groups, the use of the NCETM Spine Materials will be evident, providing clear guidance for making small steps to ensure there are no gaps in the children’s learning.

- **Questions** to challenge thinking – teachers use questioning throughout every lesson to check understanding – a variety of questions are used, but you will hear the same ones being repeated including ‘How do you know?’, ‘Can you prove it?’, ‘Are you sure?’, ‘Is that right?’, ‘What’s the value?’, ‘What’s the same/different about?’, ‘Can you explain that?’, ‘What does your partner think?’, ‘Can you imagine?’, ‘Listen out for more common questions you hear’. Questions are also used to challenge children who have grasped the concept. Children are expected to listen to each other’s responses and may be asked to explain someone else’s ideas in their own words, or if they agree/disagree etc. You will often hear the teacher asking if anyone would like to challenge a given answer, rather than telling a child they are incorrect. It is about the children learning from each other and processing and discussing their ideas to ‘convince’ and ‘support’ their thoughts.

Due to the episodic style of the lessons with frequent questioning, lessons may appear to move slower than in the past. In some lessons there may be more talking and less recording in books.

- **Discussion and feedback** – pupils have opportunities to talk to their partners and explain/clarify their thinking throughout the lesson, but will be expected to complete some written work independently.

- **Reflecting** - this may be linked to use of the textbook – images on the IWB may be from the textbooks or other sources (listed above). All children’s written work will be completed in their mathematics books. However, some reflection will not be recorded in their mathematics books, but completed orally within the lesson. Children may be asked to complete feedback independently or with a teacher (dependent on level of support required); this allows children to reflect on their own learning.

- **Practising** - not drill and practice but practice characterised by variation – all work will be recorded in the children’s maths books and may be titled with ‘guided work’ for the ping pong part of the session and ‘I work’ to indicate where they are practising independently.

- **Marking** – we have a whole school marking policy which is followed within every classroom. The policy throughout the school requires that learning is ticked if correct, dotted if incorrect and a comment is only made if/when a teacher feels this is necessary to move learning forward. The assessment of the learning objective is consistent in all year groups; one tick by the L.O. indicates the children are working towards the learning objective, two ticks indicate they have achieved it and a ‘?’ will be used for those children who have not achieved the L.O. The most valuable feedback is given during a lesson. Children are encouraged to use red pens for peer-assessment and purple for self-assessment or feedback. Fluency sessions will often be marked together as a whole class, as will the guided practice, the children will use a red or purple pen for this also. Children’s worked will be marked in green pen by adults.

- **SEN pupils** – may be supported by additional adults, different resources, differentiated activities. They may also complete additional activities outside of the mathematics lesson. Additionally, challenging activities may also be planned for children who are exceeding the curriculum expectations.

NB: We do not label our children, we purely work on the basis that they are emerging, working at or exceeding the year group expectations. We have high expectations of all children and strongly believe that all children are equally able in mathematics. Some may take longer to grasp concepts and may need careful scaffolding or extra time/support (guided groups, same day catch-up, additional homework, pre-teaching, intervention group, morning/after school clubs, specific parent support).

- **Planning** – Planning document will usually clearly identify;
  - Learning focus for the week
  - Year group
  - The focus for the starter
  - A 'Teach it' section including; intro/hook, developing conceptual understanding (CPA), modelling, let's practice sections
  - A learning objective and aim for the lesson
  - Planning for a 'securing understanding'; Do it - fluency Questions, what it is, standard and non-standard, conceptual variation. Moving onto; Twist it - Do you agree? (Yes/No, True/False), Explicit use of misconceptions and/or mistakes, what it's not and conceptual variation
  - Planning for 'deepening and securing'; Solve it e.g. the missing digits/number, here's the answer, probing question (Always/Sometimes/Never, Odd one out, etc) and procedural Variation
  - Plenary
  - focus
  - Resources required
  - Common misconceptions identified
  - How to support struggling learners
  - How to extend learners
  - Assessment focus identified

N.B. Fluency sessions in addition to the mathematics lessons are not expected to be formally recorded on a lesson plan.

- **Differentiation** – All lessons are planned with care to ensure there are methods, strategies and resources to support struggling learners and to extend children who have rapidly grasped the concept.

At Katherine Semar our aim is that all children reach their full-potential. This is done through careful planning with small progressive steps, giving all pupils the opportunity to see and apply mathematics in everyday life, providing opportunities for children to experience concepts, objects and situations which may be unfamiliar to them, secure understanding is developed through the CPA approach, children have designated curriculum time to practise fluency facts, gaps are 'plugged' to ensure pupils can progress their learning on, children are supported, scaffolded and challenged appropriately and time is dedicated on areas of the mathematics curriculum to ensure a depth of knowledge and understanding is acquired.

## **OUR MONITORING**

At Katherine Semar we believe that the most effective way to monitor the impact of our Mathematics policy is to utilise and triangulate a broad range of moderating activities, involve our stakeholders, and apply these regularly, consistently and robustly. Through our annual Monitoring, Evaluation and Review cycle, we employ the following monitoring activities in Mathematics:

- **Lesson Observations and Learning Walks**
  - Senior Leaders and Subject Co-ordinators regularly undertake planned and unplanned lesson observations and learning walks. These have a clear focus and feedback and findings are used to inform individual and whole-school Continuing Professional Development (CPD), School Development Planning and future monitoring activities.
- **Internal and External Assessments**
  - In line with the school's assessment policy, each year group undertakes a range of internal and external assessments as appropriate to their age and stage of development. Data from these assessments is used to



inform planning, teaching, interventions, and adult support to ensure all children are making maximum progress.

- **Deep Dives**

- 'Deep Dives' of books, planning and learning outcomes are carried out by subject coordinators, Senior Leadership Team and whole staff.

- **Pupil Progress Meetings**

- Half-termly pupil progress meetings are held between class teachers and senior leaders. These review the progress of each child as an individual and ensure quality first teaching and relevant interventions ensure every child makes maximum progress.

- **Pupil Conferences**

- Regular conversations and feedback with our pupils allows for pupil voice to be integrated with the development of our mathematics curriculum, teaching and learning.

- **Governor Visits**

- As part of the Governors' Monitoring, Evaluation and Review cycle, lead governors in each subject, make regular visits to school to monitor progress towards the school development plan.
- Monitoring activities include a range of teaching and learning observations, discussions with subject co-ordinators, meetings with pupils, visits to subject specific celebration assemblies, work dives and subject leader reports.

- **Pupil interviews**

- Senior staff, subject co-ordinators and governors take regular opportunities to listen to the views of pupils in relation to their experience of Mathematics at our school and their feedback actively informs subject development through our curriculum action plan.

- **Staff Meetings**

- Teachers to feedback at staff meetings to support the development of the mastery curriculum at Katherine Semar (what is working successfully, where can we progress and develop further?).

- **Mathematics Monitoring Days**

- Termly mathematics monitoring days led by subject leaders with a changing focus such as; planning dives, book looks, learning wall evaluations, learning walks of mathematics teaching and learning, analysing mathematics data.