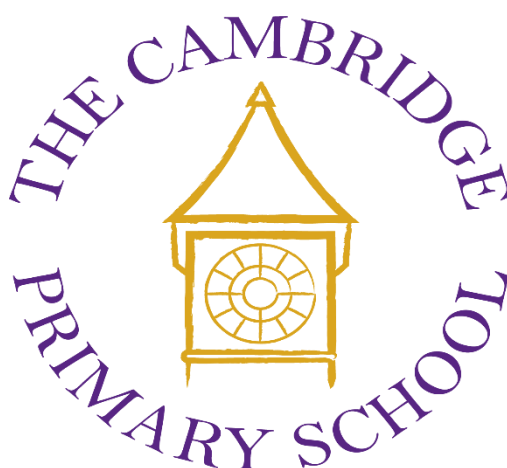


THE CAMBRIDGE PRIMARY SCHOOL

'Inspiring Minds Together'

MATHEMATICS POLICY

2023



Date of Approval:	May 2023
Date of Next Review:	May 2024

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Mathematics Policy

INTENT

At the Cambridge Primary School, we intend for pupils to develop a love of maths and enjoy the excitement and challenge that problem solving brings. We use a maths mastery approach to deliver active and involving teaching that promotes curiosity, creativity, resilience and growth mindset. All learning is put into real life context, where possible, to help children understand the role of mathematics in the world around them and encourage them to become life long learners.

IMPLEMENTATION

At the Cambridge Primary School, maths will be taught each morning for an hour, daily. Each lesson uses a mastery approach and reasoning is embedded into all elements of learning. In addition to this, there will be separate, short fluency lessons that precede the lesson to strengthen number proficiency and knowledge. Skills progression for maths (including mental maths) have been mapped out across the school to enable children to make sufficient progression in maths each year.

Our implementation:

- A consistent, systematic, high quality, whole school approach to teaching mathematics using the Maths No Problem scheme. Children are introduced to Maths No Problem methods in Reception and enter key stage 1 with a secure foundation to this approach
- Maths story books are available in the school library to help children link maths to real life contexts and these are also used in lessons to support learning
- Lessons are taught using a multi method approach to problem solving to support the implementation of reasoning skills and rich questioning is present throughout each lesson
- Children use objects and pictures to problem solve in order to help them visualize abstract ideas
- Whole class teaching with scaffolding, stretch and challenge for all learners
- Sentence stems are available for all mastery tasks
- Additional same day intervention for children struggling with mathematical concepts or deepening understanding
- Misconceptions are identified and used as a starting place for concept building and challenges
- Self assessment is present in every lesson to encourage reflection, ownership and growth mindset
- Monitoring of the planning, teaching and assessment weekly to ensure mathematics is of high quality and consistent across the school
- Planned opportunities throughout the curriculum to extend beyond 'mathematics time' so learning is applied, reinforced and relevant connections identified for the children
- Close monitoring of children making the slowest progress through regular assessments, data analysis and pupil progress meetings with provision adjusted accordingly
- Summative assessment at three points in the year to guide summative judgements and identify any gaps in knowledge

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- All staff are trained to be experts in MNP and are passionate about achieving excellence for all and seek advice if necessary
- Ensuring maths is connected across the curriculum through planning and collaboration
- Access to lessons on Maths No Problem online hub. These lessons are used for daily teaching and training is available for all staff

Learning Characteristics

We consider it is of vital importance that children learn and develop positive characteristics as individuals alongside academic knowledge and skills. These are qualities that will ensure they continue to learn and thrive throughout their school life and beyond.

We will foster the school's own characteristics of being brave, innovative, collaborative and taking ownership:

- **Brave-** Children are supported to recognise, demonstrate and enhance their individual talents as a process of developing self-confidence. Challenges faced are celebrated and discussed daily during learning reflection time in the supportive and positive environment we strive to create. This will encourage the children to develop the resilience to attempt challenge, solve problems and to keep trying with a task despite experiencing difficulties.
- **Innovative-** Children are given the chance to express individualism in their learning so they become creative, independent thinkers. As their confidence grows, children are guided to find more than one way to complete a task or solve a problem; to be creative through different media and resources and to evaluate what they have done and modify accordingly.
- **Collaborative-** Children have opportunities to work and play alongside others as partners, in small groups and as a class. As members of the wider school community, children can work together in the School Council and on other projects. They will begin to learn the value and skills of working together towards a common goal. This characteristic is developed through the modelling of warm, respectful relationships and positive attitudes towards diversity. Stereotypical ideas are challenged and all families are welcomed, valued and respected equally which fosters a sense of belonging. Children are subsequently supported to develop a positive sense of their own identity and culture in addition to respect for others, including those with beliefs, cultures and opinions different to their own.
- **Ownership-** Children are encouraged to steer their own learning across all areas through the choices they make. This is supported through guidance that regularly prompts simple self-reflection and evaluation. The children can choose what, how and where they play and learn; the resources that will help them; the amount of challenge they are ready for and risks they want to take. They will take increasing responsibility for initiating their own lines of enquiry and investigation. Children are also encouraged to take ownership of their behavioural choices. To help them stay safe, they are educated about rules and boundaries; why we have them and why we should follow them. Within the safe environment of The Cambridge Primary School, we encourage the children to make choices, take responsibility for their choices, whilst teaching them to recognise and avoid hazards.

We will encourage the learning of these characteristics in maths lessons by providing opportunities for the children to:

Brave:

- Find their own methods to solve a problem
- Share their 'marvellous mistakes' to help their friends learn
- Self assess their own work and reflect on the level of support they may need

Innovate:

- Create challenges for their group or maths partner
- Develop their reasoning skills to apply their understanding to real life contexts
- Invent their own methods for problem solving

Collaborate:

- Practically explore new problems in small groups or with maths partners
- Mixed ability groups for practical problem solving and discussion
- Children are encouraged to discuss every problem with their partner or group to find solutions and address misconceptions

Ownership:

- Children to choose if they need to work on a table with adult support
- Children to self assess at the end of every lesson
- Challenge tasks are available for each lesson
- Children are able to access resources that they feel they need during lessons

Meeting the needs of all our learners

At the Cambridge primary school we believe that deep mathematical understanding is something that can be developed with effort and focus. Therefore, maths is taught in mixed ability groups to ensure that no child has a label. Group work provides peer support and the stimulus of discussion with children of all abilities. This enables each group to utilize the range of skills that different children may have including; having a good memory, good practical skills or good speaking and listening skills. These skills can be pulled together in a team to solve problems. Children approach each lesson in a practical way (concrete) before moving on to pictorial and then when they are confident, they are able to move on to independent work (abstract.)

We believe that success in mathematics is possible for every child. Adult support is available for those who need it within each lesson and additional intervention is available in the afternoon if concepts have not been fully embedded within the lesson. Children with a more complex level of need may need to be supported with a more individualised curriculum during some topics.

Children are stretched and challenged to deepen their understanding by: reasoning tasks where they have to explain their problem solving, posing maths problems to their friends and innovation tasks such as inventing a new method to solve a problem or creating a poster with maths rules.

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Parents as partners

We recognise and value the important role parents play in education as they know their child best. Consequently, we encourage parents to engage in an active partnership with the school. Weekly mental maths homework will be sent home so that parents can help children to consolidate their learning from that week. Parent workshops will be held so that parents can watch children being taught using a mastery approach and gain a better understanding of how to support mastery at home.

IMPACT

At the Cambridge Primary School, the impact will be seen:

- Learning walks and internal monitoring to ensure the teaching and assessment of mathematics is of high quality and consistent across the school.
- External moderation of schools within the EEE Trust
- Our tracking and assessment system (Scholarpack) which enables formative and summative assessment to be recorded so that leadership and class teachers have a clear view of progress and of any children who are not on track to make expected progress.
- Pupil progress meetings
- Sufficient and effective additional support for children in danger of falling behind or those experiencing significant difficulty, to enable them to keep up
- Fast feedback (pupil conferencing in lessons) is provided to the children to address misconceptions immediately.
- Summative assessments at three points in the year to guide, not dictate, teacher judgements

Maths Mastery

“In mathematics, you know you’ve mastered something when you can apply it to a totally new problem in an unfamiliar situation.”

Dr. Helen Drury

Maths mastery lessons have pace and teachers are facilitators who ask rich questions to extend children’s learning. Every step is deliberate, purposeful and precise. If children are struggling with a concept, more time is spent supporting and building their understanding.

Pupils are invited to demonstrate their solutions and explain their thinking. Lessons include a mixture of short tasks, explanation, demonstration and lots of practice to reinforce learning. Mastery works best when children are secure in their number facts and can free up their working memory for problem solving. At the Cambridge Primary School we have daily fluency lessons prior to our maths lessons to practice our number facts.

Maths No Problem

Maths No Problem is the scheme that we use to deliver mastery teaching. It is based on the Concrete, Pictorial, Abstract (CPA) approach to teaching. CPA is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils. Often referred to as the concrete, representational, abstract framework, CPA was developed by American psychologist Jerome Bruner. It is an essential technique within the Singapore method of teaching maths for mastery.

Background to the CPA framework

Children (and adults!) can find maths difficult because it is abstract. The CPA approach builds on children’s existing knowledge by introducing abstract concepts in a concrete and tangible way. It involves moving from concrete materials, to pictorial representations, to abstract symbols and problems. The CPA framework is so established in Singapore maths teaching that the Ministry of Education will not approve any teaching materials that do not use the approach.

Concrete step of CPA

Concrete is the “doing” stage. During this stage, students use concrete objects to model problems. Unlike traditional maths teaching methods where teachers demonstrate how to solve a problem, the CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects. With the CPA framework, every abstract concept is first introduced using physical, interactive concrete materials.

For example, if a problem involves adding pieces of fruit, children can first handle actual fruit. From there, they can progress to handling abstract counters or cubes which represent the fruit.

Pictorial step of CPA

Pictorial is the “seeing” stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

Building or drawing a model makes it easier for children to grasp difficult abstract concepts (for example, fractions). Simply put, it helps students visualise abstract problems and make them more accessible.

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Abstract step of CPA

Abstract is the “symbolic” stage, where children use abstract symbols to model problems. Students will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem. The abstract stage involves the teacher introducing abstract concepts (for example, mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols (for example, +, −, x, /) to indicate addition, multiplication or division.

Maths No Problem Lesson Structure

A typical lesson will be structured as follows:

- **Explore**

Children begin the lesson with a problem which introduces the lesson objectives. Children are encouraged to use their previous knowledge and understanding to find their own method to solve this problem.

- **Master**

Children regroup and discuss the methods that they used to solve the problem. Teachers discuss the most efficient method with the class which has been laid out by Maths No Problem. These methods can often lend themselves to what the task is. This is an opportunity to address misconceptions.

- **Guided Practise**

Children to work in pairs to complete questions from the textbook using the methods they know or have been taught in the **Let's learn** part of the lesson.

- **I do, We do, You do**

In this part of the lesson the teacher models how to solve a problem similar to the ones the children will be facing in their work books (I do). Then the class will try one together (We do), and then the children will attempt one independently (You do) so the class teacher can assess and support where necessary when the children are working in their workbooks. Teachers to plan in as many practice questions in this format as they deem needed to support deeper understanding.

- **Workbook**

Children to work through questions in their Maths No Problem workbook. With the foundations firmly laid, students should be able to move to an abstract approach using numbers and key concepts with confidence. Mastery challenges are available for children who have completed these tasks. In Year One, children are introduced to many new mathematical concepts using the concrete step of CPA. Some children are able to move on to the pictorial and abstract stages but this varies between lessons. Therefore, additional paper or photographs of practical representations can be stuck in to their workbooks in order to show their preferred method.

- **Discussion of answers /marking and misconceptions**

Once the workbooks have been completed then as a class we mark the work together, discussing different methods and celebrating ‘marvellous mistakes’.

- **Reasoning**

Reasoning is fundamental to knowing and doing mathematics. Children are taught to be systematic thinkers and articulate such thinking in clear, succinct and logical manner. It also involves being able to identify what is important and unimportant in solving a problem and to explain or justify a solution. Reasoning deepens children's understanding of mathematics and highlights any misconceptions they may have.

At the Cambridge Primary School, reasoning time is built in to lessons. Children will have opportunities to progress their reasoning skills from a novice reasoner to an expert reasoner through whole class, independent and guided reasoning sessions.