

Ivory Federation

Propps Hall Junior, Infant and Nursery School & Rushcroft Primary School

Mathematics Policy

RATIONALE

Mathematics is a creative and highly interconnected 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. Therefore, our aim is to deliver 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 enjoyment and curiosity about the subject.

The 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.

PURPOSE

Learning mathematics introduces children to the concepts, skills and thinking strategies that are essential in everyday life and support learning across the curriculum. It helps children make sense of the numbers, patterns and shapes they see in the world around them, offers ways of handling data in an increasingly digital world and makes a crucial contribution to their development as successful learners. Children should delight in using mathematics to solve a problem, especially when it leads them to an unexpected discovery or new connections. As their confidence grows, they will look for patterns, use logical reasoning, suggest solutions and try out different approaches to problems. Mathematics should offer children a powerful way of communicating; they will learn to explore and explain their ideas using symbols, diagrams and spoken and written language. They will start to discover how mathematics has developed over time and contributes to our economy, society and culture. Studying mathematics should stimulate curiosity, foster creativity and equip children with the skills they need in life beyond school.

Using the programmes of study from the National Curriculum and the Early Years Foundation Stage curriculum, it is our aim to develop:

- a positive attitude towards mathematics and an awareness of the fascination of the subject;
- competence and confidence in mathematical knowledge, concepts and skills;
- an ability to solve problems, to reason, to think logically and to work systematically and accurately;
- initiative and an ability to work both independently and in cooperation with others;
- an ability to communicate mathematics;
- an ability to use and apply mathematics across the curriculum and in real life;
- an understanding of mathematics through a process of enquiry and investigation.

BROAD GUIDELINES

CURRICULUM ORGANISATION

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. Our curriculum is organised into four distinct mathematical domains:

number sense, additive reasoning, multiplicative reasoning and geometric reasoning. The medium-term plans provide teachers with specific units of learning and desirable learning outcomes for each domain. The learning intentions and outcomes directly link each of the four areas and ensure good curriculum coverage and knowledge acquisition. Units are revisited throughout the course of the year which enables children to make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Clear links to other areas of the curriculum that enhance the children's understanding of mathematics are identified and incorporated into the document. Opportunities for outdoor learning are also highlighted which contextualises concepts and enables children to understand the importance and impact that their learning has in real life.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, the decision about when to progress is always based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly are challenged through being offered rich and sophisticated problems before any acceleration through new content. Each term is an assessment and review week which identifies opportunities for support, consolidation and challenge within each individual pupil's understanding. Those who are not sufficiently fluent with earlier material are given the opportunity to consolidate their understanding through additional practice, the use of manipulatives and targeted interventions, before moving on.

SPOKEN LANGUAGE

Our mathematics curriculum reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical reasoning, argument or proof. They must be assisted in making their thinking clear to themselves as well as others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

STRUCTURE OF LESSONS

The structure of our mathematics lessons is guided using TASC (Thinking Actively in a Social Context) developed by Belle Wallace. The recommendations within her research highlight the notion that intelligence is not fixed and we need to teach the brain to think more effectively. We value the tremendous capacity for growth within the brain: its functioning is not fixed at birth and every child can develop and improve their thinking. We therefore regularly model, share and practise the thinking skills with our children in order to promote independence and develop cognitive ability. The TASC wheel, alongside the 'learning blueprint' of our school and our educational offer, has informed how we structure the teaching of our mathematics lessons in the following cycle:

1. **GATHER AND ORGANISE**- This is where teachers assess the current level of understanding. The learning intention will be shared and children will be given the opportunity to refer to prior learning through discussion, imagery, resources and problem-solving. They will use questioning as a tool to bring knowledge forward into the working memory- this will identify the knowledge that has already integrated into their understanding of the subject and create a foundation to build on throughout the course of the lesson.
2. **IDENTIFY**- Teachers and children will refer back to the learning intention and clarify the purpose of the learning. Teachers and children will collaboratively build on criteria for evaluating and allow children to identify personal goals.



3. **GENERATE AND DECIDE**- This is a creative stage whereby children will activate the frontal cortex part of the brain by collaborating and utilising others expertise and design ideas. Here they generate their own ideas of how to achieve their goals and decide which is the most effective. Children will take autonomy over how to be successful and identify/build their steps to success.



4. **IMPLEMENT**- By now, children will be equipped with all the tools to be successful no matter their starting point. Children will have gained skills in planning, organising, decision making, and problem-solving. Together, these skills are the building blocks of resourcefulness—the ability to find and use available resources to achieve goals. They will now start to use and apply their knowledge and talents in a variety of ways.



5. **EVALUATE AND REFLECT**- This is the metacognition stage- children thinking about their thinking. In this stage, children reflect on what has been learnt and communicate this. They will reflect on both the progress made mathematically but also how they have advanced and developed as a learner. Clear links will also be made to their next stage of development.



Teachers will support children to retain and retrieve knowledge through; paying attention to cognitive load—carefully structuring tasks to limit the number of new information pupils need to process; revisiting knowledge after a gap to help pupils retain it in their long-term memory; providing children with the opportunities to retrieve the knowledge that they have previously learned and encouraging children to elaborate on what they have learned.

Teachers will use models to help pupils develop a deeper understanding of mathematical concepts. Models will only be used if they aid understanding and the ideas that the models are based on should be familiar to the children. Children should understand how the model has shown supports the idea or concept.

Teachers will use practical activities and manipulatives purposefully and ensure they are part of a learning sequence. It is important that teachers are clear about the skills or knowledge they are trying to develop in the children with a particular practical activity. A variety of practical approaches will be used to expose the children to the processes of practical mathematics in order to assist in developing the children's mathematical reasoning. All children should complete at least one element of outdoor learning every half term. This should contextualise concepts taught and enable children to understand the importance and impact that their mathematics learning has in real life.

Progression over time and in lessons is to be recognised as a pivotal element of our mathematics offer and it is the teacher's responsibility to ensure that learning is progressive, where prior knowledge is recognised as a foundation to build upon. Maths attainment and progress is assessed through both formative and summative assessment processes, using a wide range of sources such as books, pupil voice and data captures. More information related to our assessment procedures can be found in our assessment policy. The assessment and recording systems for mathematics are detailed and in line with the school Assessment Policy.

USE OF RESOURCES

There are a wide range of resources available to the school that are maintained and monitored by Mathematics Leaders. The resources are a collective responsibility for the whole school, and children are encouraged to treat resources carefully and safely. Children are expected to, where appropriate, choose their own equipment and set such equipment up for practical mathematics. The use of manipulatives helps the children to hone their mathematical thinking skills. The effective use of manipulatives aims to help the children to connect ideas and integrate their knowledge so that they gain a deep understanding of mathematical concepts. We use Numicon

to contextualise and develop the children's understanding of number. Numicon teaches the children about numbers and what they mean, before and alongside counting and patterning activities through hands-on activities, games, songs, in a structured approach. This way of teaching is supportive to all of the children, but particularly those requiring a visual, hands-on and explicit style. The manipulatives are tools of thinking which:

- Develop fluency by using a visual, practical base to develop conceptual understanding and fluent recall
- Help children to reason mathematically through the use of concrete objects and spoken language to explain and justify.
- Develop children into confident problem-solvers working in groups and independently.

The school grounds and surrounding areas offer a great resource for staff and pupils.

Calculators should not be used as a substitute for good written and mental arithmetic. They should therefore only be introduced near the end of Key Stage 2 to support pupils' conceptual understanding and exploration of more complex number problems, if written and mental arithmetic are secure. We also use 'MyMaths' and 'TimesTable Rockstars' as whole-school interactive resources for use in the classroom and at home- these both consolidate and develop children's confidence and mathematical fluency.

RECORDING

A Concrete, Pictorial, Abstract (CPA) approach to teaching mathematics is used as a method of teaching maths for mastery. 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 as highlighted in the 'Stages of Calculation' document. As a result of this, the recording of learning can take a variety of forms.

ROLE OF THE SUBJECT LEADER

A good mathematics leader ensures that all pupils can develop their knowledge, understanding, fluency and confidence in mathematics. They should provide leadership, support and guidance in the teaching of mathematics in order to secure high quality teaching. This alongside the effective use of resources, supports improved standards of learning and achievement for all learners.

They plan improvement that:

- builds their school's mathematics curriculum, raises standards of achievement and attainment and supports colleagues to teach mathematics better.

Mathematics Leaders:

- keep up to date with broad developments in mathematics and mathematics education, and consider how to share these with colleagues and pupils when appropriate;
- are aware of and take responsibility for developments that affect school mathematics policy;
- are aware of and take responsibility for addressing gender stereotyping in mathematics lessons and enrichment activities;
- implement a whole-school vision for mathematics, and advise and support colleagues on the pedagogy and appropriate resources to achieve it;
- ensure that they access continuing professional development (CPD) for the leadership of mathematics and that colleagues access CPD to address their requirements too;
- monitor provision of mathematics and pupils' progress, and contribute to the strategic development of learning in school.

CONCLUSION

The successful implementation of this policy will assist in ensuring our children are exposed to a quality mathematics curriculum that strives to ignite and enthuse them for lifelong learning. It aims to deliver a high-quality mathematics education which provides a foundation for understanding the world, the ability to reason mathematically, and an appreciation of the beauty and power of mathematics. Teachers will have a structure in

which to teach the core content of the National Curriculum which will allow them to ensure children have the mathematic skills required to understand the uses and implications of mathematics, today and for the future. Our offer will hopefully inspire children to become our mathematicians of the future.

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