



## Castle Park Primary School Mathematics Policy 2021/22

# Introduction

The development of mathematics has always gone hand in hand with the development of civilisation itself. A truly international discipline, it surrounds us and underpins so many aspects of our daily lives, such as architecture, art, music, money and engineering. And while it is creative and beautiful, both in its own right and in its applications, it is also essential for progress in other areas of learning and experience.

What is more, numeracy – the application of mathematics to solve problems in real-world contexts – plays a critical part in our everyday lives, and in the economic health of the nation. It is imperative, therefore, that mathematics and numeracy experiences are as engaging, exciting and accessible as possible for learners, and that these experiences are geared towards ensuring that learners develop mathematical resilience.

# Intent

In the early years, play forms an important part in the development of mathematics and numeracy, enabling learners to solve problems, explore ideas, establish connections and collaborate with others. In later years, learners need to have opportunities to work both independently and collaboratively to build on the foundations established in the early years.

Progression in the Mathematics and Numeracy Area of Learning and Experience (Area) involves the development of five connected and interdependent proficiencies which have no hierarchy. These are crucial considerations for schools when designing their curriculum to ensure the progression of learners.

- Conceptual understanding
- Communication using symbols



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- Fluency
- Logical reasoning
- Strategic competence

What matters in this Area has been expressed in four statements which support and complement one another and should not be viewed in isolation. Together they contribute to realising the four purposes of the curriculum.

Formal mathematics has developed through rigorous logical reasoning. It involves inventing or discovering abstract objects and establishing the relationships between them. It also teaches the difference between conjecture, likelihood and proof.

Mathematical thinking involves applying similarly logical reasoning, this time to the investigation of relations within and between concepts, along with justifying and proving findings. Indeed, understanding mathematical concepts and being able to apply and reason with the abstract representations of concepts is central to learning mathematics. And essential to this is comprehension of, and proficiency with, the symbols and symbol systems used in mathematics.

Applying mathematics requires strategic competence in the use of abstraction and modelling, and learners develop resilience, as well as a sense of achievement and enjoyment, as they overcome the challenges involved. Subsequently, mathematical activities teach learners not to be afraid of unfamiliar or complex problems, as they can be reduced to a succession of simpler problems and, eventually, to basic computations. As they reflect on the approaches used, and on their own mathematics and numeracy learning, learners can develop metacognitive skills which can help them identify steps to take to improve performance. Through this they can become ambitious, capable learners, ready to learn throughout their lives.

Experiences in this Area also contribute to developing enterprising, creative contributors, ready to play a full part in life and work. These can encourage learners to be creative



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because it asks them to play, experiment, take risks and be flexible in tackling mathematical problems.

Because mathematics is essentially abstract, it allows learners to operate with objects that do not physically exist, and to use and develop their creativity to imagine and discover new realities. It also supports numerical modelling and forecasting which can in turn encourage entrepreneurial thinking.

Mathematics and numeracy can also help learners become ethical, informed citizens of Wales and the world by providing them with tools to analyse data critically, enabling them to develop informed views on social, political, economic and environmental issues. It encourages clarity of thinking, allowing learners to understand and make reasoned decisions.

In this Area, learners can encounter contexts involving health and personal finance, where they may develop the skills needed to manage their own finances, make informed decisions and become critical consumers. Experiences in this Area will help them learn to interpret information and data to assess risk, and to use their numeracy skills across the curriculum to make effective choices, all of which can help them become healthy, confident individuals, ready to lead fulfilling lives as valued members of society.

## **New Curriculum 2022**

### **Statement of what matters**

**The number system is used to represent and compare relationships between numbers and quantities.**



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Numbers are the symbol system for describing and comparing quantities. This will be the first abstract concept that learners meet in mathematics, and it helps to establish the principles of logical reasoning. In mathematics the number system provides learners with a basis for algebraic, statistical, probabilistic and geometrical reasoning, as well as for financial calculation and decision-making.

Knowledge of, and competence in, number and quantities are fundamental to learners' confident participation in the world, and provide a foundation for further study and for employment. Computational fluency is essential for problem-solving and progressing in all areas of learning and experience. Fluency is developed through using the four basic arithmetic operations and acquiring an understanding of the relationship between them. This leads to preparing the way for using algebraic symbolisation successfully.

### **Algebra uses symbol systems to express the structure of mathematical relationships.**

Algebra is the study of structures abstracted from computations and relations, and provides a way to make generalisations. Algebraic thinking moves away from context to structure and relationships. This powerful approach provides learners with the means to abstract important features and to detect and express mathematical structures of situations in order to solve problems. Algebra is a unifying thread running through the fabric of mathematics.

Algebraic thinking is essential for reasoning, modelling and solving problems in mathematics and in a wide range of real-world contexts, including technology and finance. Making connections between arithmetic and algebra develops skills for abstract reasoning from an early age.

### **Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.**

Geometry involves playing with, manipulating, comparing, naming and classifying shapes and structures. The study of geometry encourages the development and use of conjecture, deductive reasoning and proof. Measurement allows the magnitude of spatial and abstract features to be quantified, using a variety of standard and non-standard units. It can also support the development of numerical reasoning.



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Reasoning about the sizes and properties of shapes and their surrounding spaces helps learners to make sense of the physical world and the world of mathematical shapes. Geometry and measurement have applications in many fields, including art, construction, science and technology, engineering, and astronomy.

**Statistics represent data, probability models chance, and both support informed inferences and decisions.**

Statistics is the practice of collecting, manipulating and analysing data, allowing representation and generalisation of information. Probability is the mathematical study of chance, enabling predictions of the likelihood of events occurring. Statistics and probability rely on the application and manipulation of number and algebra.

Managing data and representing information effectively provide learners with the means to test hypotheses, draw conclusions and make predictions. The process of reasoning with statistics and probability, and evaluating their reliability, develops critical thinking and analytical skills that are fundamental to enabling learners to make ethical and informed decisions.

In the Mathematics and Numeracy Area of Learning and Experience (Area), the model of progression is based on the development of five interdependent proficiencies, outlined below. This model of progression can be considered as both longitudinal and cross-sectional. To ensure progress in any mathematics learning, proficiencies should be developed and connected in time and should also develop over time.

Each proficiency may relate to multiple principles, and these are set out below.

### **Proficiencies**



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The following interdependent proficiencies have been used in developing the descriptions of learning and are central to progression at each stage of mathematics learning. Numeracy involves applying and connecting these proficiencies in a range of real-life contexts, across the curriculum.

### **Conceptual understanding**

Mathematical concepts and ideas should be built on, deepened and connected as learners experience increasingly complex mathematical ideas. Learners demonstrate conceptual understanding through being able to explain and express concepts, find examples (or non-examples) and by being able to represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.

An increasing breadth of knowledge is achieved through the learners being introduced to new mathematical concepts, and depth of knowledge is achieved through learners being able to represent, connect and apply a concept in different ways and in different situations. The concepts that learners are introduced to will become increasingly complex, and understanding the way in which concepts connect will contribute to a growing understanding of the ideas within this Area. An understanding of how mathematical concepts underpin learning help learners make connections and transfer learning into new contexts.

### **Communication using symbols**

Learners should understand that the symbols they are using are abstract representations and should develop greater flexibility with the application and manipulation of an increasing range of symbols, understanding the conventions of the symbols they are using.

The introduction and application of a new concept will involve developing an understanding of how symbols or expressions are abstract representations that succinctly describe a range of situations, thus contributing to a growing understanding of the nature of mathematics. The introduction of new symbols will add to the breadth of knowledge and the communication with symbols will contribute to refinement and growing sophistication in the use and application of skills.



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### **Fluency**

As learners experience, understand and effectively apply increasingly complex concepts and relationships, fluency in remembering facts, relationships and techniques should grow, meaning that facts, relationships and techniques learned previously should become firmly established, memorable and usable.

Development of fluency and accuracy reflects the refinement and a growing sophistication in the use and application of skills.

### **Logical reasoning**

As learners experience increasingly complex concepts, they should also develop an understanding of the relationships between and within these concepts. They should apply logical reasoning about these relationships and be able to justify and prove them. Justifications and proof should become increasingly abstract, moving from verbal explanations, visual or concrete representations to abstract representations involving symbols and conventions.

Refinement and growing sophistication in the use and application of skills will be demonstrated through the application of increasingly sophisticated logical reasoning. The development of an understanding of relationships between mathematical concepts and the development of justifications and proofs, leads to a growing understanding of the nature of mathematics and helps learners make connections and transfer learning into new contexts. The development of justifications and proof help support the increasing effectiveness of learners.

### **Strategic competence**

Learners should become increasingly independent in recognising and applying the underlying mathematical structures and ideas within a problem, in order to develop strategies to be able to solve them.

Recognising mathematical structure within a problem and formulating problems mathematically in order to be able to solve them relies on an understanding of the ideas and



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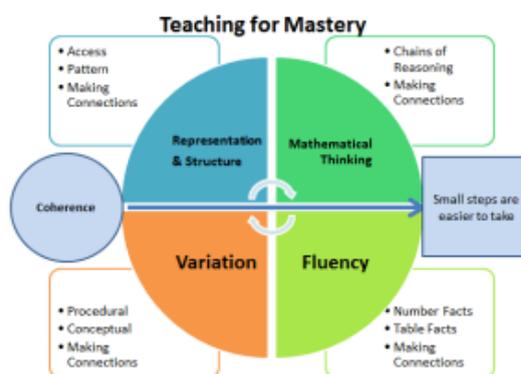
disciplines within areas of learning and experience alongside a depth of knowledge. It also supports making connections and transferring learning into new contexts and developing increasing effectiveness as a learner. The recognition of the power of mathematics in enabling the representation of situations should lead to a growing appreciation of the usefulness of mathematics.

# Implementation

At Castle Park we are working in 3 Progression steps  
Progression Step 1 - Reception  
Progression Step 2 - Year 3  
Progression Step 3 - Year 6

By the time children leave Castle Park, all children will be fluent in key concepts of Mathematics, be able to reason and have developed strategies to solve problems. Our maths curriculum follows elements of a Teaching for Mastery Approach. At the centre of our maths vision is the belief that all children have the potential to succeed. We believe that all children, where possible, should have access to the same curriculum content and should deepen their conceptual understanding by tackling challenging and varied problems.

**The principles of a Teaching for Mastery Approach are:**



### Coherence

Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalization of the concept and the ability to apply the concept to a range of contexts.

### Representation and Structure



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Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation.

### **Mathematical Thinking**

If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned and discussed with others.

### **Fluency**

Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics

### Variation

Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.

## **Teaching strategies**

### **The pedagogical principles**

Curriculum design for all learners is underpinned by twelve pedagogical principles, which state that good learning and teaching:

1. maintains a consistent focus on the overall purposes of the curriculum
2. challenges all learners by encouraging them to recognise the importance of sustained effort in meeting expectations that are high but achievable for them



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3. means employing a blend of approaches including direct teaching
4. means employing a blend of approaches including those that promote problem-solving, creative and critical thinking
5. sets tasks and selects resources that build on previous knowledge and experience and engage interest
6. creates authentic contexts for learning
7. means employing assessment for learning principles
8. ranges within and across Areas
9. regularly reinforces the cross-curricular skills of literacy, numeracy and digital competence, and provides opportunities to practise them
10. encourages learners to take increasing responsibility for their own learning
11. supports social and emotional development and positive relationships
12. encourages collaboration

### **To support the curriculum, pedagogy should help learners to develop:**

- a strong disposition to learning
- strong metacognitive skills
- critical, creative, problem-solving skills
- highly effective communication skills

The learning environment is a key enabler for the curriculum. It should:

- encourage learners to be independent, to have a say in their own learning and to take increasing responsibility for it
- include all learners
- allow learners of all ages to experience authentic learning opportunities both indoors and outdoors
- enable learners to apply, use, consolidate and extend skills
- be secure and safe

### **To support this, practitioners should:**

- form positive and respectful relationships with learners and support good relationships between peers



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- respond to all learners
- plan engaging and developmentally appropriate learning opportunities informed by regular observation and ongoing assessment of learning and the learner's stage of development
- prompt learners to think about and reflect upon their learning in order to extend thinking and make connections
- challenge learners and have high expectations
- actively engage with parents, carers and the wider community as partners in learning
- be reflective and seek to engage in ongoing professional learning

**In order to provide the children with active and stimulating learning experiences, a variety of teaching and learning opportunities are adopted:**

- Children may work individually on a task, in pairs or in a small group, depending on the nature of the activity.
- Wherever possible, practical 'real' activities are used to introduce concepts and reinforce learning objectives.
- Opportunities to transfer skills learnt, to real situations, are used whenever possible.
- Activities are planned to encourage the full and active participation of all pupils.
- Teachers use carefully planned questions throughout the lesson in order to meet the needs of all abilities. Self-differentiation is used regularly in order for children to challenge themselves.
- A CPA approach is utilised in all year groups, all classes have access to a range of mathematical manipulatives to support learning and understanding.
- A CPA calculation is followed by all year groups.
- Teachers place a strong emphasis on correct use of mathematical language; this is supported by key vocabulary being displayed.
- Stem sentences are used and modelled during whole class input. • Teachers value pupils' oral contributions and create an ethos in which all children feel they can contribute.
- Throughout the school, children learn number facts and times tables using exciting videos and songs daily
- Whole school displays are used to encourage children to learn and recall rapidly facts which will support their maths learning.
- Reasoning and problem solving skills are taught explicitly by teachers as part of maths lessons in order to model the use of correct mathematical vocabulary and written reasoning.



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## Curriculum planning

### Long term

Long Term Planning Teachers will use is based on the White Rose Maths resources. All mathematical topics will be taught in blocks so that children can master each mathematical concept and apply it across a range of contexts.

### Short term

All teachers will plan for a 'Small Step'

1. Assessment prior learning
  2. Practical activities using concrete resources or manipulatives
  3. Whole class focus varied Fluency questioning
  4. Self differentiation
  5. Collaboration
  6. Reasoning and problem solving
- The short term plan is constantly amended and updated based on assessment for learning and the needs of the class.
  - Our children regularly self assess their learning using various approaches including: Summative (have i got the work correct?), formative (does i fully understand the concept?) and Ipsative (How do I feel about my progress, where do I want to go next ?
  - Teachers will deploy TAs to support children based on the assessment for learning.
  - Everyday children will complete a maths starter that embeds fluency and procedural methods.



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## Impact and Assessment

Assessment takes place at three connected levels: short-term/ day to day, medium-term and long-term.

These assessments are used to inform teaching in a continuous cycle of planning, teaching and assessment.

### **Short term/ Day-to-day assessments**

As part of the ongoing teaching and learning process, teachers will assess children's understanding throughout the lesson during regular pit stops and will act accordingly. At the end of the lesson, the children will traffic light and comment on their understanding. Teachers will then use this information to inform next day's planning or intervention.

Feedback will be given throughout the lesson and in books in accordance to the school's marking policy.

Teachers will make use of diagnostic questioning at different stages of pupil's learning, including prior to a unit beginning to identify misconceptions, during a unit of work to check these have been addressed and also at the end.

Any children who have not met the learning objective, will be identified with a clear idea of how the child's needs will be met

Learners will also be taught to assess and evaluate their own achievements by recognising successes, learning from their own mistakes and identifying areas for improvement.

### **Medium term**

At the end of each block, children will take an assessment test to help teachers check progress and understanding of content. **Gap analysis will be carried out and used to inform planning.**

Class teachers regularly update the assessment tracker that is correlated to the progression steps for the new curriculum.

### **Long term**

In Autumn 1 and Summer 2, the School will complete the Welsh Government National tests in Mathematics

Children will be assessed against the progression steps at the end of each year



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## Intervention programmes

**Intervention programmes For September 2021, before thinking about maths catch up and/or intervention, what we will be taken into account first and foremost is children's mathematical well-being for future learning, including:**

- **building young children's confidence,**
- **their willingness to have a go**
- **their mathematical self-esteem and enjoyment**
- **establishing firm relationships with the adults in school**

**The school operates a flexible approach to intervention programmes based on weaknesses identified in day to day learning, mid term assessments, pupil progress meetings and through ongoing data analysis by the senior leadership and maths lead.**

**Teachers use in class guided groups led by themselves and teaching assistants to tackle children's misconceptions in maths.**

## MAT Children in Mathematics

### **Greater Depth Pupils**

Pupils demonstrate high ability in mathematics in a range of ways and at varying points in their development. Pupils who are gifted in mathematics are likely to:

- learn and understand mathematical ideas quickly;
- work systematically and accurately;
- be more analytical;
- think logically and see mathematical relationships;
- make connections between the concepts they have learned;
- find rules and identity and explain patterns easily;
- be able to visualise, imagine and explain properties of shape quickly;
- be able to apply their knowledge to new or unfamiliar contexts;
- communicate their reasoning and justify their methods;
- ask questions that show clear understanding, and curiosity about, mathematics;
- challenge or question mathematical rules;
- prove/disprove rules/generalisations based on mathematical evidence;
- Create algebraic rules based on sequences and patterns



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- take a creative approach to solving mathematical problems;
- sustain their concentration throughout longer tasks and persist in seeking solutions, absorbed in their work;
- be more adept at posing their own questions and perusing lines of enquiry;
- have an ability to work calculations/problems out in their head very quickly;
- Able to relate their understanding of maths to areas such risk and uncertainty;
- verbally articulate their strategies, findings, observations with peers/adults;
- apply mathematics to different contexts and environments;
- apply their mathematics to both routine and non-routine problems easily.

## Equal opportunities and inclusion

All pupils will have equal opportunity to reach their full potential across the mathematics curriculum regardless of their race, gender, cultural background, ability or physical disability.

We will ensure we show no prejudice by starting all children at the same entry point and differentiating from there.

## Environment

It is important that both the whole school and classroom environment supports both the learning and teaching of mathematics. The school aims to provide a mathematically stimulating environment:

- through the use of working walls to support learning and teaching in a lesson or series of lessons.
- through interactive displays that promote mathematical thinking and discussion
- through displays of pupils' work that celebrate achievement, including WAGOLLS ('What a good one looks like')
- by providing a good range of resources and manipulatives for teacher and pupil use. In every classroom, resources such as number lines, hundred squares, place value counters, double-sided counters, place value charts and multiplication squares are displayed as appropriate and used for whole class or individual work. Children are encouraged to access these independently.



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## Homework / Blended Learning

We recognise the importance of making links between home and school and encourage parental involvement with the learning of mathematics. Homework provides opportunities for

- children to practise and consolidate their skills and mental arithmetic methods
- to share their mathematical work with their family
- to prepare for their future learning.

Children in Years 1-6 receive Mathematics homework each week, based on this week's learning.

Children can complete the tasks at home and are also given provision to complete in school if required.

Children are also encouraged to practise their tables and number bonds at home each week