

# Askwith Primary School

## Mathematics rationale

Our curriculum offer for mathematics begins in Early Years. 'Children develop quickly in the early years and a child's experiences between birth and age five have a major impact on their future life chances.'

*EYFS Statutory Framework, 2021*

The purpose of mathematics at Askwith Primary School is to equip all children (this includes SEND, EAL, PP and vulnerable children) with the knowledge, skills and understanding to become confident mathematical problem solvers. Our planning, teaching and assessment of the curriculum is informed by the nine principles of cognitive science (Daniel Willingham). This includes the 'must haves' or the end states in the child's mind and the 'could dos' or the teacher behaviours that alter the states in the child's mind. In mathematics, we recognise the 'must haves' as the alteration to long term memory that allows children to retrieve knowledge fluently, and to have a positive self-image as a learner. We recognise the 'could dos' as sequenced lessons of the essential knowledge, the explicit teaching of mathematical vocabulary and abstract concepts within mathematics and deliberate practice for knowledge to become fully embedded in the long term memory to ensure this knowledge can be built upon.

At Askwith Primary School, we believe that all children's education begins in Early Years. Our curriculum is aligned to the Early Years Framework and shows the sequential steps, granular, of essential knowledge acquired from Reception to Year 6. We have a determined approach that drives us to ensure that all children meet the expected standard in mathematics and have the knowledge required for secondary school. Our mathematics curriculum allows children to develop their cultural capital. Purposeful and natural links to **Fundamental British Values, SMSC and global themes** are an integral part of our curriculum and are threaded through the mathematics curriculum.

All children (this includes SEND, EAL, PP and vulnerable children) are taught to think and reason mathematically, applying skills fluently and efficiently, arriving at the accurate answer in all areas of mathematics. A dialogic approach is fundamental to all areas of learning at Askwith Primary School and underpins all teaching and learning. All children discuss their learning and talk through possible solutions to given problems, applying the most efficient method. All children will be given the opportunity to deliberately practice a mathematical concept, before becoming fluent and then applying this knowledge to reason and problem solve mathematically. The class teacher always teaches the lowest 20% to ensure all children meet their endpoints and they keep up with the expected standard. Mathematics education at Askwith Primary School provides children with an understanding of the world around them and a curiosity and enjoyment of the subject. At Askwith Primary School, we are passionate about ensuring that all children receive a sequenced, knowledge rich mathematical education. This in turn ensures that all children are able to reason mathematically and solve mathematical problems. All classes have a daily diet of mathematics, which includes timed elements of mental strategies to enhance fluency.

Intent	Implementation
<p>All knowledge is embedded from 2021-2022/previous years</p> <p>The mathematics curriculum starts in Early Years</p> <p>Monitoring and evaluation continues to be robust and roles of TAs developed in this process</p> <p>The planning, teaching and assessment of the mathematics curriculum is informed by the nine principles of cognitive science (Daniel Willingham)</p>	<ul style="list-style-type: none"> <li>• All knowledge checks for all pupils include connected knowledge from the previous units of learning in order to ensure there are no gaps or forgotten knowledge</li> <li>• All gaps or forgotten knowledge to be addressed prior to teaching new knowledge</li> <li>• Planning demonstrates the sequential steps of essential knowledge acquired from Reception to Year 6</li> <li>• The mathematics curriculum is aligned to number and numerical patterns in the Early Years framework</li> <li>• Book scrutiny</li> <li>• Drop-ins planned</li> <li>• Lesson studies</li> <li>• Knowledge checks carried out by all TAs to ensure subject knowledge is secure</li> <li>• Planning and learning journeys consider the essential knowledge and how to guide the pupil's thinking</li> <li>• Planning demonstrates an obvious progression of skills and knowledge throughout the school</li> <li>• Working memory capacity is considered when planning and teaching</li> <li>• Blocking allows pupils sufficient time to become fluent in their knowledge</li> <li>• Curriculum meets the needs of all pupils; pupils are provided with the appropriate level of challenge</li> <li>• Pupils have the opportunity to deliberately practise newly acquired knowledge</li> <li>• Mini knowledge checks and full knowledge checks will ensure that this</li> </ul>

All staff have an up-to-date knowledge of dialogic/cognitive science principles throughout the school

Mathematics is taught throughout the school through deliberate practice in a supportive environment which enables children to improve their fluency leading to mastery and an alteration to long term memory

Continue to ensure that the teaching of maths is consistent across the school (Quality of Education 1)

knowledge is embedded in their LTM and that all pupils meet their endpoints

- Pupils articulate how they know more, remember more and therefore do more
- Instil growth mindset ethos which talks about successes and failures in terms of effort rather than ability (4Rs)
  
- Training programme for all staff
- Series of lesson studies for TAs
  
- The school curriculum progression overview builds on knowledge from one year to the next.
- Knowledge checks are carefully planned to assess the connected knowledge from the previous year. All knowledge gaps are filled before moving on children move on to the current year curriculum.
- Mini knowledge checks re carefully planned to ensure that areas of mathematics that have been taught are revisited throughout the school year.
- For mathematical components covered at the end of a school year, the knowledge checks are planned for the following school year.
  
- Number and Place Value:
  - broken down into sub units
  - individual unit curriculum maps
- Curriculum maps to show essential knowledge build up in granular steps (term by term)
- Purchase membership to White Rose maths for all year groups to ensure consistency across the school
- All teachers agree consistency of approach with White Rose
- Training for TAs

The mathematics curriculum is planned in a sequenced way to build knowledge, skills, understanding and mathematical vocabulary from Early Years to Year 6.

The mathematics curriculum will equip children with a deep and embedded understanding of mathematical components.

Mathematical vocabulary (including tiered vocabulary)

Oracy is taught deliberately, explicitly and systematically across the school and throughout the mathematics (Quality of Education 5)

Further develop pupils' understanding of how feedback contributes to knowledge build up and positive attitudes to learning (Behaviour and attitudes 2)

- Daily lesson plans show the key aspects for long term memory, ensuring working memory is not overloaded.
- Titles are planned and used in mathematics lessons to ensure children are clear about the mathematical knowledge to be acquired in that lesson.
- All misconceptions are addressed in every lesson and displayed on the mathematics display boards as an opportunity to learn from mistakes and in still a growth mindset in mathematics.
- Teachers will plan lessons to create deeper understanding rather than accelerate children to new content.
- Concrete, visual and abstract resources will support children's learning ensuring components are embedded.
- Variation will be planned into each lesson to develop all children's (this includes SEND, EAL, PP and vulnerable children) confidence when reasoning and problem solving.
- The acquisition of vocabulary is planned into each unit
- Family group focus - children to discuss learning in mathematics
- Work scrutiny focuses on examples of high quality feedback
- Pupil discussions re: how is the feedback helping them?
- Pupils present the impact of feedback to Parents/LGB
- CEO/governors question pupils on the impact of feedback

<p>Reading is prioritised in mathematics</p>	<ul style="list-style-type: none"> <li>• Opportunities are given across all year groups for reading. When appropriate this is personalised to meet reading need, in particular in Key Stage One and Early Years</li> </ul>
<p>Enhancements and leadership opportunities reflect need in 2022-23</p>	<ul style="list-style-type: none"> <li>• Increase leadership opportunities in mathematics across the school for all pupils (Personal Development 3)</li> <li>• Rolling programme of mathematics visits and visitors</li> </ul>
<p>Mathematics rationale is updated where relevant</p>	<ul style="list-style-type: none"> <li>• Evidence informed practice continues to inform effectiveness of the mathematics rationale and curriculum</li> </ul>

### SMSC in Mathematics

Spiritual, moral, social and cultural attributes are developed in our pupils throughout the mathematics curriculum:

Throughout mathematics, children develop **socially** through reasoning and problem solving questions where they have to work together to discuss the most efficient methods to answer questions and to explore alternative methods together. Through this dialogic approach, children develop socially and they begin to feel a sense of achievement due to the effort they have put in this in turn builds their confidence and self-belief in their mathematical ability.

**Spiritual** education in mathematics provides opportunities to make sense of the world around them. They develop deep thinking and an ability to question the way the world around them works. Children are encouraged to see patterns, sequences and scales in the world around them and they use mathematics as a way to explore the world fully.

**Moral** education is a thread that runs throughout mathematics. All learners are provided with opportunities to apply their mathematics knowledge in 'real life' contexts to reason and solve problems. The logical aspects of this types of problem solving strongly links to right and wrong decisions in mathematics.

**Cultural** education in mathematics centers around the rich history and cultural context in which mathematics was first discovered or use. The ancient civilisations relied heavily on the use of mathematics.

## **Vocabulary in mathematics**

Our dialogic approach is integral to our practice. All classrooms are language-rich and support children to develop their bank of vocabulary and language. All teachers know that there are different tiers of vocabulary and that vocabulary can be vertical and horizontal in meaning. Alongside our dialogic approach, each classroom consistently displays tier two vocabulary that comes from classroom dialogue on 'What Do Words Mean?' displays and each topic display board includes key words. This tends to be subject-specific, tier three vocabulary. The vocabulary for each unit of knowledge is identified and pre-planned including previously taught vocabulary and current vocabulary (see essential knowledge overviews). This vocabulary is discussed as it arises within the context of the lesson in all years and the vocabulary is also taught/reinforced during weekly vocabulary sessions in years 1-6. All classrooms are literature-rich and high-quality topic books/texts are chosen to provide reading opportunities within each unit of knowledge.

## **Substantive knowledge in mathematics**

The mathematics curriculum is one in which substantive knowledge and skills merge in a way that does not happen in any other subject area. The taught knowledge in mathematics is substantive rather than disciplinary and children will be taught to make links across different mathematical components to build this substantive knowledge in their long term memory. Children are taught what they need to know, the declarative knowledge, and how to use what they know, the procedural knowledge. Learning journeys in mathematics specifically reference connected knowledge from other areas of the mathematics curriculum, providing children the opportunities to interleave their mathematical knowledge and make purposeful and meaningful links.

### **Why this? Why now?**

Each unit of mathematics is taught discretely and in Year 1 to Year 6 all classes teach in the same sequence of learning:

- Number and place value
- Calculation
  - Addition and subtraction
  - Multiplication and division
- Fractions
- Measures
- Geometry
- Position and direction
- Statistics
- Ratio and proportion (Year 6 only)
- Algebra (Year 6 only)

We it is important to teach number and place value in September on all classes as a secure knowledge of number and place value underpins all areas of mathematics.

Throughout all units of knowledge in mathematics, each child has a personalised balance of practice, reasoning and problem solving with each mathematical concept and this will differ for each child, depending on their needs. When teaching reasoning and problem solving, it is important for teachers to distinguish between questions that rely on the method and where the method is being deliberately practiced and questions where which method to use is unknown to the child. Children are taught to be able to identify which strategies they will need to tackle different types of problems, including the associated vocabulary. Not all lessons contain new content there will be time for deliberate practice and fluency of previously acquired knowledge.

### **Creativity in mathematics**

Creativity is a strong thread that permeates our mathematics curriculum. Opportunities for children to approach mathematics in different ways and to solve problems are carefully planned into each unit of work. Mathematics problem solving is a creative process and children are encouraged to show their thinking and mistakes are embraced as a part of the problem solving journey. By using this approach, children become empowered and they learn what can be possible with a strong mathematical understanding.

Mathematical creativity allows children the opportunity for collaborative learning and communication through carefully planned learning activities. Children can investigate, pose questions and become creative decision makers and mathematical risk takers in an environment where it is ok to make mistakes thus developing resilience and confidence.

*"Creative mathematics is all about developing problem-solving skills which enable pupils to solve unfamiliar mathematical problems creatively. Pupils realise that there might be more than one possible solution to solving a given situation and learn how to adopt diverse strategies towards problem-solving which best suit their learning styles, capabilities and situation. Pupils are also given the time, space and resources to explore mathematical skills and concepts and can devise their own path to a solution."*

Elaine Muscat, Scientix Deputy Ambassador

### **Stretch and Challenge**

Dame Alison Peacock tells us in her book *Assessment for Learning without Limits*, we can get it very wrong when "false, limiting assumptions are made about children's capacity to learn."

There is no national definition of 'most able'. Abilities are not fixed and the situation is always fluid. In every primary classroom, there will always be a wide range of abilities that change over time. We believe, therefore, that when 'stretching and challenging' our pupils, it is vital to do so within an ethos of high expectation and knowing our pupils well. This enables our planning to be focused and therefore effective in meeting the needs of all pupils.

The most able learners in mathematics will be exposed to a range of reasoning and problem-solving questions. These reasoning and problem solving questions will provide children with the opportunity to deepen their knowledge through more abstract concepts, involving multi-step problems and bringing together more than one component of the mathematics curriculum.

## **Assessment in mathematics**

Assessment, both formative and summative, is an integral part of day to day mathematics' planning, teaching and learning at Askwith Primary School.

We ensure that children are provided with age appropriate, formative feedback, allowing them to move their learning on in a sequential way. This gives children the opportunity to demonstrate any connected knowledge held in the long term memory. A balance of verbal and written feedback is provided and children use this to move on in their learning, referring to this connected knowledge. As a school, we feel it is important that the children engage with this feedback and that they are able to articulate their own progress.

Throughout a unit, mini knowledge checks, including low stakes quizzes, take place to ensure knowledge is fully embedded. We believe that these opportunities for regular practice, allow the children opportunities to recall their knowledge and apply it in different ways. Any forgotten knowledge is immediately recapped to address misconceptions or misunderstandings. Knowledge checks then take place 2 weeks, 6 weeks and 12 weeks after the end of the unit to check knowledge has been embedded in the children's long term memory. All children are given knowledge checks from the previous year's learning before any knowledge checks for the current year. This ensures all children are secure in their connected knowledge before building on that knowledge.

We use summative assessments to monitor the children's progress with three data collection points throughout the year. We believe that it is important that children in Y2 and Y6 are assessed using standardised tests so that they are familiar with the format and structures which they will be exposed to in the SATs.

## **Enhancements**

Each year, a programme of extra-curricular clubs is created. Alongside this, a series of visits and visitors are planned to enhance the children's knowledge and cultural capital.

"Pupils should be encouraged through research, investigation and experimentation to explore all aspects of society and their place within it. Contextual studies should allow pupils to understand cultural differences and the diversity of belief. Individuality and personal responses should be valued ... and pupils should be encouraged to discuss and present, through their work, opinions, values, beliefs and experiences." Croner 182 CCH

**Reviewed: September 2022**