The Bishop of Winchester Academy

Sapere Aude

Mallard Road
Bournemouth
Dorset
BH8 9PW

Mathematics Curriculum

Intent

Curriculum Vision

Maths is the universal language by which we make sense of the world around us and how its problems are solved. The Mathematics curriculum aims to build a strong foundation in mathematical concepts fostering both fluency and problem solving and aims to stimulate, develop and maintain students curiosity, interest and enjoyment in Maths.

Students are supported in becoming mathematically competent and functionally numerate through a curriculum that challenges students to build a stronger conceptual understanding of Maths – enabling them to reason formally, connect ideas and solve problems by selecting appropriate techniques. They become accurate and efficient problem solvers who can use their Maths skills in unfamiliar contexts and in real-life situations. By encouraging creative, mathematical thinking, students can make connections across different areas of Maths as well as cross-curricular links which promote deeper learning.

The curriculum develops a level of data literacy and fluency in interpreting statistics that equip students for future studies and living in the modern world. Living life to the full in a mathematical context means knowing sophisticated techniques that provide precise ways of analysing things but also being able and willing to consider why and what we should model quantitatively as well as how we should do this.

Students develop the ability to investigate the world around them through developing the statistical skills required to collect, analyse, interpret and present data, whilst honing their analytical and logical reasoning skills.

Students will follow a mastery curriculum consisting of 8 'Big Ideas' to support them in becoming Mathematically fluent, financially numerate and statistically competent.

Concepts and Skills

We have identified eight 'Big Ideas' for students to explore during their time at the Academy.

1. **Numerical Fluency**: calculating with mental and written methods, types of number, estimation and rounding, powers, roots and index laws
2. **Proportional Reasoning**: fractions, decimals and percentages, ratio and proportion, scale, congruence and similarity
3. **Thinking Algebraically**: expressions, equations, formulae, inequalities, sequences

4. **Mathematical Modelling**: coordinates in all four quadrants, plotting and interpreting different graph types, units of measure and conversions, kinematics and compound measures
5. **Shape & Position**: 2D and 3D shapes and properties, angles, Pythagoras and Trigonometry, transformations and vectors
6. **Probability Theory**: probability scale, simply probability, probability from experiments, tree and Venn diagrams
7. **Analysing and Summarising Data**: the data handling cycle, collection of data, analysing data, displaying data, measures of central tendency
8. **Applied Mathematics**: developing specialist applications of mathematical concepts in real-life contexts e.g. personal finance and statistical analysis

This is how we see our students' skills developing during their seven-year journey.

Key Stage 3

Students will broaden their understanding of the basic mathematical concepts that they were taught in Key Stage 2. They will have opportunities to develop a conceptual understanding through application and problem solving including real-life concepts. In addition, the introduction of new topics including algebra, graphs and statistics, will strengthen their skills in reasoning and interpretation. Key Stage 3 students will independently model mathematical situations and start to make connections between different areas of mathematics alongside their other subjects. Students will begin to become confident in their use of mathematical language to reason in number, geometry and algebra problems.

Key Stage 4

Students will demonstrate a deeper understanding of mathematical concepts. Students will be more confident, secure and fluent in interpreting diagrams and solutions, selecting the appropriate method to break down and solve problems and reason geometrically. They will be able to independently apply, interpret and evaluate their solution to complex problems. They will leave The Bishop of Winchester Academy confident in their ability to relate their knowledge to real-life contexts, from personal finances to managing their own business, solving every-day problems and prepared for further mathematical studies and/or the modern workplace.

Key Stage 5

Students will follow the mathematical pathway that best fits how they wish to specialise academically in their post-16 studies. We hope that all students who meet the prior attainment criteria will chose to study a formal Level-3 Mathematics course and we will always ensure we offer a comprehensive formal curriculum that supports as many students as possible to successfully study Mathematics at an advanced level. For students not choosing to study a Level-3 qualification we will provide bespoke support in developing the mathematical skills they need to support their current and future studies. Where necessary we will provide a bespoke curriculum to support students who need to work on filling in gaps in their mathematical toolbox in order to develop general mathematical fluency and/or to introduce them to the more advanced Mathematical skills that are specific to the context of their chosen Level-3 option subjects.

Vocabulary

Whole-school literacy strategies, such as the Frayer model, will be used in Mathematics in a way consistent with the teaching of vocabulary in other subject areas to enable students to develop cross- curricular, linguistic schema.

Conventions such as the use of Latin and Greek prefixes in geometric terms and other tier

three mathematical vocabulary will be explicitly explored so that knowledge of the etymology of mathematical vocabulary that they already know can help students when encountering new terms in their studies of Mathematics, Statistics and other subject areas.

The following examples illustrate how the etymology of some mathematical key terms may be explored to help support the mastery of related mathematical ideas and the learning of related academic vocabulary:

Bisect: verb, relates closely to the perhaps more familiar term 'dissect' used in a practical science context that means 'to cut' with the prefix 'bi' seen in high frequency words like bicycle explaining why the term in Mathematics means to cut in half.

Quadratic: adjective, is a mathematical adjective meaning squared, it however also includes the abbreviation 'quad' which is often used as short for 'quadrilateral' and in real-life describes buildings that form a square shape and might also be connected to other subject specific vocabulary such as the quadrant of a graph.

Homework

Curriculum-aligned homework helps our students achieve mastery in Maths by consolidating and extending what they learn in lessons so that they know more and remember more. It also guides students to build strong independent study habits.

In Key Stage 3, students complete Sparx homework. Homework is sequenced in line with the curriculum to help embed knowledge in long-term memory so that students know more and remember more. Low-stakes Do Nows at the beginning of each lesson strengthen long-term memory retrieval by testing cumulative knowledge of previous learning.

At Key Stage 4 students continue to use Sparx to support with consolidation of the GCSE course and regular retrieval throughout year 10. In Year 11, students switch to paper based homework and complete weekly past papers to support with retrieval practice and enabling students to apply their problem solving skills to exam style questions to support with preparation for benchmark examinations in GCSE Maths and GCSE Statistics.

This helps our students achieve mastery in Maths. Students who need extra support to achieve mastery are supported by our 10:10 programme in Maths and all have access to our daily Homework Club.

Implementation

Overview Statement

The curriculum in Maths is sequenced coherently so that concepts and skills are developed over time. This supports students of all abilities, especially SEN students including those with processing difficulties, who need early identification and additional support both inside and outside the classroom (this is especially important for those with a diagnosis of Dyscalculia and Dysgraphia). New content is thoughtfully introduced to maximise its relevance and links to cross-curricular Mathematical and Statistical skills. Planning is informed by Rosenshine's Principles of Instruction and Cognitive Theory. Cross curricular links are explicitly referenced and exploited in order to deepen understanding. Homework, daily retrieval-based 'Do Nows' and frequent formative assessment strengthen memory as do mid-term and end-of- year assessments which are cumulative. Vocabulary is developed in Maths through the Frayer Model and students are taught to read, write and speak like a Mathematician. The use of technology is employed to strengthen learning, specifically with scientific calculators, graphing software and on-line learning platforms including Sparx and Dr Frost. Learning character is developed each lesson through the use of the six Learning Applications (LApps).

Impact

Key Stage Three

Through studying the Key Stage Three curriculum, students will be able to perform Mathematical skills including mental and written methods, use a scientific calculator efficiently and use algebra to describe the world around them. They will have developed a deep knowledge of Mathematical concepts such as modelling and be able to apply this knowledge to describe and solve problems outside the classroom involving time, money, 3D representations and data. Students develop all the Lapps but especially their Awareness and Independence through Statistical analysis and inference. Students have an introduction to the disciplinary literacy required to be able to communicate like an expert Mathematician. Cognitive Theory is interleaved throughout the curriculum so that students gain a knowledge of how they learn and manage their cognitive load.

Key Stage Four

The Key Stage Four curriculum builds upon students' initial understanding, extending their knowledge in the areas of: algebra, especially quadratics; statistical analysis, for example inference and interpretation and mathematical modelling, particularly compound measures and kinematics. Through developing their knowledge of each of these areas, students can confidently make links between different mathematical areas and apply this to solve increasingly complex problems. Students also develop an understanding of the entwined nature of their studies, though explicit cross-curricular links and inter-disciplinary study. Their progress in Maths is recognised through their GCSE entries in Mathematics and Statistics and the Level 2 Certificate in Further Mathematics, which acts as a benchmark of their mastery and provides them with the national currency needed for access to further education and employment. Students use their knowledge of cognitive theory to recognise and use the most impactful methods of revision and retrieval practice.