# Maths Curriculum Intent

## Our ambitious aims

***By the end of their time with us at Gloucester Academy, our students will be able to:***

- solve problems relating to each of the Big Ideas in maths; think mathematically in order to make secure, logical connections based on their knowledge and understanding of mathematics.
- have the confidence and resilience to explain and reason their method, written or spoken, using the correct mathematical language.
- climb their personal mathematical mountain to empower them to study maths and further maths at A-level and Degree level.
- understand the importance of mathematics in real life, whether this be through academic achievement or its applications in the real world.

## Big ideas

***To achieve our aims, students will be exposed to and develop a deep understanding of several powerful mathematical concepts***

| Concept | Definition | Rationale |
|---|---|---|
| **Number** | *Relationships between units and their value. Expressed using words, symbols or figures.* | Number forms the building blocks for further study in mathematics. The ability to use core number skills fluently and with accuracy enable students to solve problems in everyday life. Crucially students must understand place value and how to order numbers, including integers, decimals, fractions, percentages and negatives. Students learn and apply the four basic operations in a range of contexts and understand the correct hierarchy of order of operations. |
| **Algebra** | *The representation of unknown quantities using letters* | Students understand that algebra can be used to generalise the structure of arithmetic and to formulate mathematical relationships between two or more unknowns. |
| **Ratio/Proportion /Rates of change** | *The quantitative relationship between two or more amounts* | Students learn how ratio and proportion permeates all other areas of maths. They need to be confident in using ratio and/or algebra to solve problems: e.g. use proportion to solve equations and apply to similar shapes. Students are able to apply their knowledge to other areas of the curriculum, such as algebra, geometry and probability. |
| **Geometry/Shape** | *The use of points, lines, surfaces, shapes and solids* | Students understand how geometry can be used across different parts of mathematics to develop deductive reasoning and proof. Moreover, geometry allows for students to develop visualisation and spatial reasoning. Through geometry, students are introduced to proof - a key part of Maths study at a higher level - which allows them to construct general mathematical arguments that always hold true. |
| **Statistics/ Probability** | *Collecting and analysing numerical data in large quantities* | Students understand the importance of statistics in the real world, and how they can help us to tell a story. Statistics simplifies large amounts of data into simplified representations that allow us to understand that data better. Probability permeates much of the scientific method and is fundamental to how financial systems work. Students need to grasp the basics in secondary, whilst being introduced to its scope. |

## Curriculum journey

***In maths, our students will study an ambitious curriculum that is both challenging for all and broad and balanced in scope.***

| Year | Summary of study | Narrative & Rationale |
|---|---|---|
| ***7*** | • Four basic operations, FDPs and negative numbers<br>• Hierarchy of order of operations<br>• Ratio<br>• Basics of algebra<br>• Properties of shapes, angles and area and perimeter | In KS3 students begin by learning about **number** and the four basic operations: addition, subtraction, multiplication & division. The first topics they encounter in year 7 form the basis of the mathematics they will learn at GA, and underpin the topics students will learn over KS3. For example, a solid understanding of multiplication & division is the foundation needed for students to learn **ratio/proportion**, **statistics** such as averages and **algebra** such as solving equations etc. |

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|---|---|---|
| | • Collecting and organising data | Students will use the knowledge that they have gained about **number** to introduce them to formal **algebraic** notation for the first time. Students will look in depth at algebraic notation, expressions and equations across KS3, as it is a crucial building block that underpins topics such as **algebraic** graphs, expansion of brackets and rearranging formulae. Students will also build upon their understanding of **statistics** acquired at KS2, and be equipped with the mathematical tools to collect and analyse numerical data.<br><br>To ensure students have a strong understanding, our key concepts are weaved throughout the KS3 curriculum in order to build a deep understanding of each topic and to see their interconnectivity. For example, when teaching area and perimeter we will use examples with fractional or decimal lengths to weave these **number** ideas into **shape**. This stops students from seeing each topic as a standalone entity and helps students to see connections between them.<br><br>Across KS3, topics such as **algebra** and **statistics and probability** are revisited frequently, with students going into greater depth each time. This allows students to gain a secure and deep understanding of topics, and the language required, within our curriculum. The curriculum allows students to master substantive and disciplinary knowledge, with a focus on making links between what they have learned and how it fits into the bigger picture of previous mathematical study and the mathematics they will encounter in future study. |
| ***8*** | • Powers and Indices including hierarchy of operations<br>• Prime numbers, LCM and HCF<br>• Area and Perimeter, conversion between units<br>• Compound measures<br>• Circles and the use of Pi<br>• Plotting graphs<br>• Equations and Inequalities<br>• Linear sequences<br>• Constructions & similar/congruent shapes<br>• Surface area & volume<br>• Averages and range<br>• Introduction to probability | |
| ***9*** | • Estimation<br>• Collect like terms, expand and simplify brackets<br>• Index laws<br>• Standard form<br>• FDP<br>• Ratio and Proportion<br>• Multi step equations and simultaneous equations<br>• Real life graphs | |
| ***10*** | • Linear equations involving brackets and unknowns on both sides<br>• Pythagoras' theorem<br>• Trigonometry<br>• Geometric Progression<br>• Surds<br>• Plot and interpret graphs<br>• Solving quadratic equations and inequalities<br>• Percentage growth and decay<br>• Error intervals<br>• Surface area and volume<br>• Iterative processes<br>• Functions<br>• Gradients and rates of change<br>• Construction<br>• Circle theorems<br>• Similar and congruent shapes<br>• Transformations<br>• Probability<br>• Transform graphs<br>• Vectors | The GCSE follows the Edexcel specification. In the same way as in KS3, topics are taught based on pre-requisite knowledge. Students meet new mathematical ideas that build on the strong foundations from KS3 learning. An example of this is the Sine and Cosine rule, which builds upon the right-angle trigonometry from Year 9.<br><br>Students also meet entirely new mathematical ideas such as composite functions and vectors, but these new ideas build on the foundations from before. i.e a secure knowledge of algebra is needed to access composite functions. This allows retrieval of information in all topics, in order for students to develop a deeper understanding.<br><br>As with KS3, students are given an awareness of how the Mathematics they study in Year 10 is a building block for further study at A-Level or undergraduate level. As topics are revisited in KS4, there is a focus on interweaving with other topics and making links between different areas of mathematics. This is possible since students have now encountered a greater range of topics. By sequencing our curriculum like this, students are able to make strong schematic links between topics which can be recalled in future study.<br><br>In year 11 we run a reactive scheme of learning based on a full set of mock exams at the end of year 10. This allows us to fill any knowledge gaps from the previous year; for students who are able to demonstrate a high level of understanding, we are able to spend more time studying topics in greater depth. We then build on ideas seen in year 10 and extend them, often through combining concepts or theorems. i.e. In circle theorems we look at problems that involve multiple theorems and then setting up and solving equations in circle theorems, or in probability, we look at conditional probability but then also how to set up algebraic problems involving probability. |
| ***11*** | • Pythagoras' theorem & Trigonometry in 3D & Bearings<br>• Sequences<br>• Rationalising Surds<br>• Solving quadratic equations and inequalities<br>• Functions<br>• Circle theorems<br>• Conditional Probability<br>• Vectors | |