Curriculum Information
Mathematics

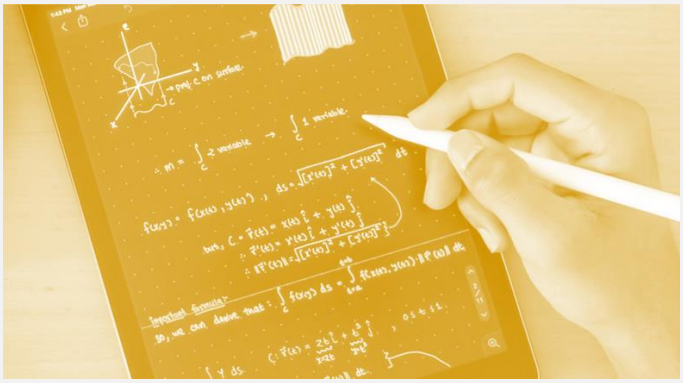
Subject rationale – Why study the subject? What benefits does it bring?

Mathematics forms an integral part of any child's education. It is a discipline with a vast history, developed over centuries by inquisitive minds seeking to understand and explain the world around them. Mathematics connects many other disciplines across science and technology, but also stands in its own right. Having mathematical fluency in basic arithmetic and secure understanding of the mathematics in personal finances are essential life skills for any member of society. An effective mathematics education should provide students with the skills to appreciate the world around them, to organise and reason arguments mathematically, the confidence to tackle problems they face, and a curiosity to explore more of the subject. These principles form the basis of our ethos in the mathematics department, and the rationale behind our curriculum.

In mathematics we believe our students should be developing their mathematical fluency. We want students to develop a conceptual understanding of the core ideas in maths through varied and frequent practice, and be able to apply this knowledge in familiar and increasingly complex contexts. The curriculum will build upon core skills and encourage students to develop links between concepts, ensuring they appreciate the interconnectedness of the subject. This ensures that students are equipped with a mathematics toolkit with which they can select the appropriate tools to reason mathematically and solve problems. It is expected that the majority of students will progress through the curriculum at a similar pace, with the readiness to advance to the next stage of learning evidenced by secure understanding of topics. Students who quickly grasp concepts will be challenged to deepen their understanding through more complex problems.

We will aim to:

- Deliver a structured curriculum with carefully sequenced elements, allowing fundamental skills to be secured at first, and focusing on learning topics in depth before moving on
- Use resources to provide opportunities for students to build procedural and conceptual understanding simultaneously
- Highlight and emphasise the connections between areas of mathematics
- Design lessons to meet the needs of students, taking into account current levels of understanding and providing different representations of mathematical ideas to facilitate the building of new understanding
- Question all students in lessons to ensure they develop the necessary mathematical fluency as well as think deeply about the topics they are studying
- Challenge and support all students through appropriate questioning and scaffolding
- Choose and sequence tasks both in lessons and as homework that will provide students with the opportunity for 'intelligent practice', developing a depth of understanding that is sustained over time



Curriculum Information
Mathematics

KS3 curriculum overview

Year 7

Throughout year 7 pupils will be building upon previous knowledge taught in primary school with some additional new content of a higher order of difficulty. By the end of Year 7, our aim is that all pupils will have been exposed to a range of high quality, challenging mathematics which can be applied to their lives. They will be beginning to link topics to previous learning and to current affairs, where possible. They will be able to address misconceptions and begin to have fluency in their mathematics as well as application, reasoning and problem solving. Routine procedures in year 7 mathematics will become second nature and pupils should be able to communicate using correct terminology. Key facts such as number facts (including multiplication tables), formulae as well as key algebraic techniques, are learnt and practiced regularly in order to avoid cognitive overload in working memory. This helps students to focus on new ideas and concepts.

Decimals: All operations

Percentages: Conversions and of amount

Ratio: Simplifying ratio

Algebra: Single brackets and solving equations including brackets

Averages: mean, median, mode and range

Angles: triangles, quadrilaterals, straight lines

Properties of shapes

Area: triangles and quadrilaterals

Assessment Overview

Assessment points

P1 Assessment – November - (P1 Revision List)

P2 Assessment - (P2 Revision List)

Year 8

Throughout year 8 pupils will be building upon previous knowledge taught both in primary school and year 7. By the end of Year 8, our aim is that all pupils will have been exposed to a range of high quality, challenging mathematics which can be applied to their lives. They will be beginning to link topics to ones previously learnt and also to current affairs, where possible. They will be able to address misconceptions well and have fluency in their mathematics as well as application, reasoning and problem solving. Routine procedures in year 8 mathematics will become second nature and pupils should be able to communicate using correct terminology.

Factors, multiples and primes
Index notation: manipulation of index laws
Algebra: substitution; rearranging formulae; solving equations; forming algebraic expressions and equations
Ratio; sharing in a ratio
Proportion: direct
Pie charts

Percentages: Increase and decrease including multipliers; percentage change
Area & Perimeter: composite shapes and (including circles)

Volume; prisms and cylinders
Statistics Projects: Charts diagrams and correlation
Surface area: prisms including cylinders
Sequences: including nth term

Coordinates
Graphs: plotting and links to sequences
Probability: listing outcomes; sample spaces; mutually exclusive events; relative frequency and notation

Assessment Overview

T1 Assessment - (T1 Revision List)

Topic Assessment: Shorter targeted topic assessments occur across KS3 roughly every five weeks.

Curriculum Information
Mathematics

KS3 curriculum overview

Year 9

Throughout year 9 pupils will be building upon previous knowledge and preparing for the beginning of GCSE. By the end of Year 9, our aim is that all pupils will have been exposed to a range of high quality, challenging mathematics which can be applied to their lives and applied to their further studies in maths. They will be able to link topics to ones previously learnt, understand that the previous knowledge learnt allowed them to learn this higher order mathematics. Pupils will also continue to apply their maths to current affairs, where possible. They will be able to address misconceptions well and have fluency in their mathematics as well as application, reasoning and problem solving. Routine procedures in year 9 mathematics will become second nature and pupils should be able to communicate using correct terminology.

Similarity **Pythagoras' Theorem** **Trigonometry** **Transformations:** translations; reflection; rotation; enlargement **Equations recap** **Linear equations**	**Quadratics** **Venn diagrams & set notation** **Probability** **Angles:** polygons and parallel lines **Percentages:** compound and simple interest	**Percentages:** Building on interest rates and reverse percentages **Inequalities:** Solving and representing on a number line **Plotting linear – graphs:** Plotting graphs given equation, shading regions **y=mx+c**: Determining the gradient of a line given two points
Assessment Overview P3 Assessment - (P3 Revision List) T2 Assessment - (T2 Revision List)		

Topic Assessment: Shorter targeted topic assessments occur across KS3 roughly every five weeks.

KS4 curriculum overview – GCSE Mathematics

At Bishop Challoner we follow the Edexcel Mathematics specification and have done so with great success for a number of years.

The aims and objectives of the Mathematics scheme of work are to enable students to:

- develop fluent knowledge, skills and understanding of mathematical methods and concepts
- acquire, select and apply mathematical techniques to solve problems
- reason mathematically, make deductions and inferences, and draw conclusions
- comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

These are achieved by building on the studies in Key Stage 3; either at a foundation or higher level. At the start of year 10, students will be placed on either the foundation or higher pathway. The pathway that they follow will be chosen on the basis of what is best for each individual student, in order to maximise their learning and outcomes. Subject content by pathway and by term (the order that topics are taught in may vary).

Curriculum Information
Mathematics

KS4 - Higher Pathway

Higher Pathway GCSE Mathematics YEAR 10

Half term 1: algebra: simplifying expressions; solving equations; solving quadratics; solving simultaneous equations; rearranging formulae; expanding brackets; factorising; substitution; forming expressions
Autumn mock (2 papers)

Half term 2: number: all operations with fractions, decimals and percentages, converting recurring decimals to fractions; standard form, estimation, calculations with bounds, working with indices (including fractional and negative)

Half term 3: data: sampling; scatter diagrams; pie charts; frequency polygons; cumulative frequency diagrams; box plots; histograms; averages from frequency tables; **number:** ratio: dividing a quantity into a ratio; combining ratios; expressing and manipulating ratios
Spring mock (2 papers)

Half term 4: algebra (graphs): co-ordinates; drawing line graphs; equations of lines; parallel and perpendicular lines; sketching quadratic/cubic functions, exponential functions; transforming functions **probability:** probability revision (listing outcomes; theoretical probability, sample spaces), tree diagrams

Half term 5: geometry & measure: area and perimeter of rectangles; circles; trapezia; parallelograms; triangles; composite shapes; sectors; surface area and volume of prisms; circle theorems
Summer mock (3 papers)

Half term 6: geometry & measure: angles in polygons; angles in parallel lines; nets, plans & elevations; maps & scale drawings; Pythagoras; congruency of triangles

Higher Pathway GCSE Mathematics YEAR 11

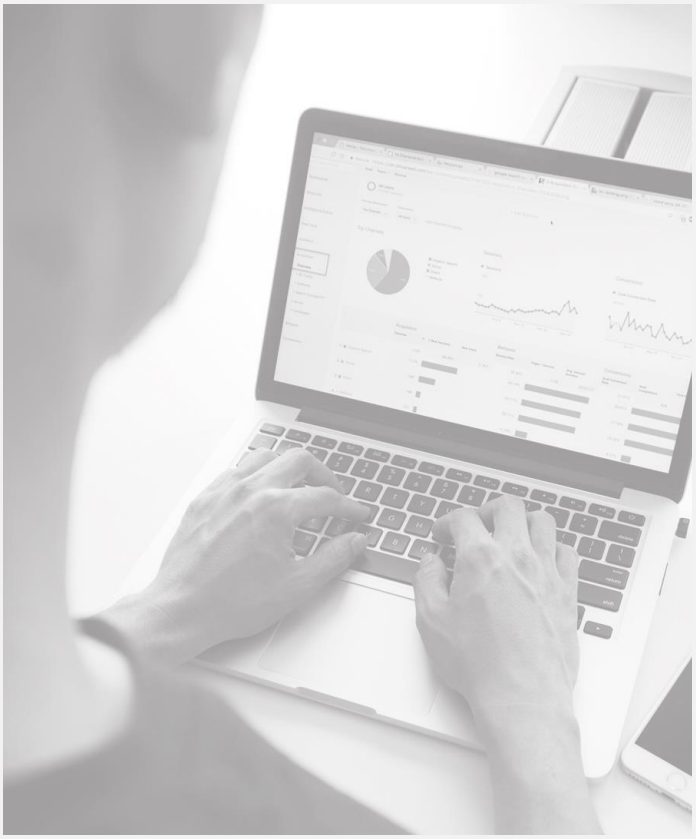
Half term 1: geometry and measure: Pythagoras in 2D and 3D; trigonometry (right angle trigonometry and non-right angle trigonometry); **algebra:** functions

Half term 2: numbers: surds; rationalising denominators; **algebra:** sequences & quadratic sequences; linear & quadratic inequalities; completing the square; quadratic formula; iteration;
December mock (3 papers)

Half term 3: geometry & measure: transformations; compound measures; direct & inverse proportion; length/area/volume scale factors; **algebra:** gradients of functions and area under graphs

Half term 4: geometry & measure: loci & construction.

From February half term of Year 11, all classes will be embarking upon revision.



Curriculum Information
Mathematics

KS4 - Foundation Pathway

Foundation Pathway GCSE Mathematics YEAR 10

Half term 1: algebra: simplifying expressions; solving equations; solving quadratics; expanding brackets; factorising; substitution
Autumn mock (2 papers)

Half term 2: number: all operations with fractions, decimals and percentages, standard form, estimation, bounds

Half term 3: data: pie charts; bar charts; pictograms; averages; averages from frequency tables; scatter diagrams; **number:** ratio: dividing a quantity into a ratio; expressing and manipulating ratios
Spring mock (2 papers)

Half term 4: algebra (graphs): co-ordinates; drawing line graphs; equations of lines; parallel lines; sketching quadratic/cubic functions, **probability:** probability revision (listing outcomes; theoretical probability, sample spaces)

Half term 5: geometry & measure: area and perimeter of rectangles; circles; trapezia; parallelograms; triangles; composite shapes; sectors; surface area and volume of prisms;
Summer mock (3 papers)

Half term 6: geometry & measure: angles in polygons; angles in parallel lines; nets, plans & elevations; maps & scale drawings; Pythagoras

Foundation Pathway GCSE Mathematics YEAR 11

Half term 1: algebra: simultaneous equations; rearranging formulae; forming and solving equations; solving simultaneous equations graphically; **geometry and measure:** Pythagoras problems; trigonometry

Half term 2: algebra: sequences; inequalities; **number:** surds; **probability:** tree diagrams; Venn diagrams; frequency trees
December mock (3 papers)

Half term 3: geometry & measure: transformations; compound measures; direct & inverse proportion

Half term 4: geometry & measure: loci & construction. From February half term of Year 11, all classes will be embarking upon revision

Assessment Overview

The current GCSE examination can be taken at two different levels:

- Higher (grades 9 to 4)
- Foundation (grade 5 to 1).

The higher papers only contain grades 9 to 4 questions and therefore are not suitable for all candidates. Careful assessment is made of each individual student to ensure that they are entered for the examination that will enable them to maximise their potential.

Students will be required to sit three examination papers; one non-calculator and two calculator. Each paper lasts for 1 hour 30 min.

LEVEL 2 CERTIFICATE IN FURTHER MATHEMATICS

This is an advanced course suitable for students likely to achieve a grade 8 or 9 in the GCSE Mathematics and who are likely to study mathematics at A-Level.

Assessment overview

The course is examined through two papers: Non-calculator paper lasting 1 hour 30 minutes
Calculator paper lasting 2 hours. Students will be required to sit three examination papers; one non-calculator and two calculator. Each paper lasts for 1 hour 30 min.

Curriculum Information
Mathematics

KS5 curriculum overview

A-Level Mathematics	A-Level Further Mathematics	Core Maths
The study of A Level Mathematics requires an ability to visualise a problem and then use mathematical principles to solve it. It has overarching themes of mathematical argument, language, proof and modelling. During the first year of study you will engage in both pure and applied mathematics. The pure element begins by building the essential skills required for A-level study before addressing some key concepts and includes polynomials, coordinate geometry, trigonometry, calculus and logarithms. The applied element looks at some of the key ideas in both Statistics and Mechanics, and covers representation of data, discrete random variables, hypothesis testing, motion in a straight line, force as a vector and Newton's laws of motion. In your second year of study, you will engage in more pure and applied mathematics and undertake three exams to obtain an A-level in Mathematics. The pure element begins by focusing on methods of advanced maths, building on the knowledge obtained in year 12. It then progresses onto looking at applications of advanced maths. You will study more trigonometry and calculus as well as numerical methods, differential equations and vectors. The applied maths element builds on the Statistics and Mechanics studied in the first year, as well as including new topics modelling with probability, the normal distribution, projectile motion and moments. Students require a minimum grade 7 to study A Level Mathematics.	The study of A Level Further Mathematics is a course that fully prepares students for studying maths or other science-based subjects at university. It is an interesting and challenging course and you will learn about many exciting branches of mathematics, both pure and applied. During the first year, you will study matrices and complex numbers as part of the pure content of the course. These two new aspects of maths are not part of the mathematics A Level. Alongside this, you will study numerical methods and modelling using algorithms. Numerical Methods consists of numerical calculus approximating functions and rates of convergence. Modelling with Algorithms includes networks, critical path analysis and linear programming. In year two you will look deeper into matrices and complex numbers, as well as study more advanced areas of pure mathematics, such as further calculus, hyperbolic functions and differential equations. You will also study a third application area of mathematics, this being either further statistics or further mechanics. Statistics topics include the Poisson and Geometric distributions, bivariate data and Chi-squared tests. Mechanics topics include work, energy, power, impulse, momentum and centre of mass, as well as looking at force in more depth than in the maths A level. Students require a minimum grade 8 to study A Level Further Mathematics.	Core Maths is a one-year level 3 qualification, equivalent to an AS qualification, that allows students not taking A Level to continue with studying mathematics. Our Core Maths course will include topics such as analysing data, personal finance, statistical techniques, critical analysis and modelling. It will help you to develop your own mathematical thinking and problem-solving skills. Most of the problems will be embedded in the context of other disciplines and real world problems. They have been chosen specifically to support you work in other subjects. It will be particularly helpful if you are studying Biology, Geography, Business Studies, Economics or Psychology. Students require a minimum grade 5 at GCSE to study Core Maths.

Curriculum Information
Mathematics

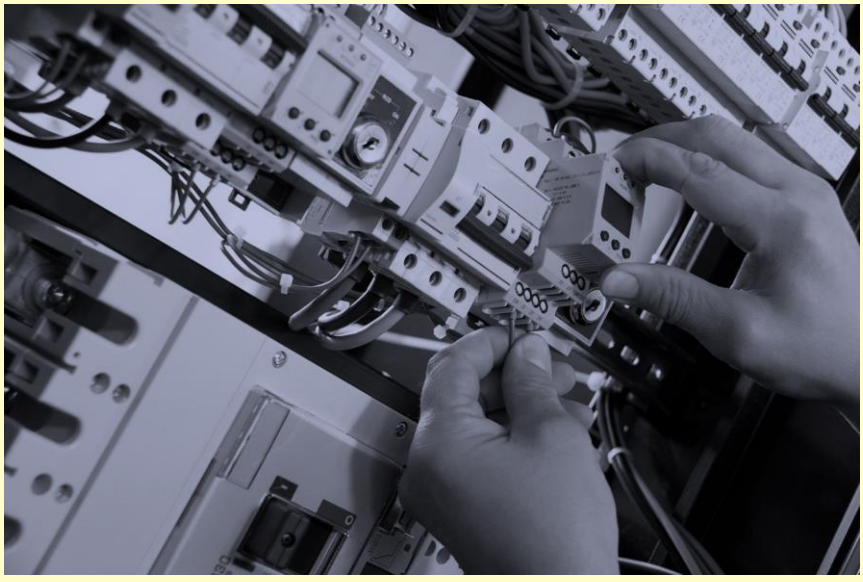
KS5 curriculum overview

Assessment overview

Students will be following the MEI course for the Mathematics A Level. This entails sitting three examinations at the end of the course: Pure with Statistics; Pure with Mechanics: Pure with Comprehension. This means two-thirds of the course is pure mathematics, and one-third is applied.

Students opting to study A Level Further Maths will also be following the MEI course and will sit the AS examinations at the end of the year 12. This consists of three paper on Further Pure, Numerical Methods and Modelling with Algorithms. For those wanting to go to study the full A Level then they would need to sit these three exams again at the end of year 13 plus their third application paper, be it Further Statistics or Further Mechanics.

Students opting to study the level 3 Core Maths qualification will be following the AQA course and will sit two examination papers at the end of the year of study.



Career opportunities

There are a wide range of careers available through studying Mathematics.

These include:

- Astronomy
- Accountancy
- Civil Engineering
- Teaching
- Operational Research
- Air Traffic Controller
- Electrical Engineering
- Stockbroking
- Insurance
- Market Research
- Debt Support Work
- Payroll Management
- Statistics
- Economics
- Pensions Management
- Quantity Surveying
- Trading
- Actuarial Work
- Valuation
- Bank Cashiering