

## Year 13 Further Maths

### **Curriculum Intent**

We believe mathematical intelligence is expandable, and that every child can learn mathematics, given the appropriate learning expectations and experiences within and beyond the classroom. Our curriculum map reflects our high expectations for every child. Every student is entitled to have the opportunity to master the key mathematical content for their age, by receiving the support and challenge they specifically need.

The principles underpinning our curriculum planning can be mapped to the six school values:

#### **Excellence**

We encourage a deep understanding of the mathematical concepts expected at each stage. We achieve this by allowing the pupils to represent concepts in a variety of different ways and by revisiting topics via retrieval tasks and by revisiting topics at successively deeper levels. Although the department's priorities are wide, a key focus is promoting excellent exam results for each individual student so their options are broad for when they leave school.

#### **Resilience**

We encourage resilience in students so that their work is consistent throughout each year. Some revision for key assessments is given on-line and most students will always have a 'next task' available to stretch them further and encourage greater progress. We strive always to provide a pathway to success for every student at every stage. We encourage resilience through an increased focus on problem solving in most areas of the curriculum.

#### **Independence**

We encourage students to be independent by providing individual expectations for the work that should be completed and the concepts that should be mastered. We encourage good mathematical communication for each individual student, especially in their written communication.

#### **Teamwork**

We encourage students to work in teams both in classroom discussions and some classroom activities as well as special-event activities.

#### **Respect**

We encourage students to have a clear understanding of what their school and maths lessons hope to achieve in terms of learning and progress. We expect students to respect beauty of maths, the work done by many previous generations, the usefulness of maths to themselves, and the usefulness of maths to the society they live in. We expect students to respect their learning environment both for their own sake and for those around them. We expect students to respect their own potential by giving them high targets and clear expectations.

#### **Creativity**

We encourage students to sense the artistry in mathematical concepts and in the work of mathematics from previous generations. We encourage students to appreciate and develop an elegance both in argument and communication. We encourage imagination as the curriculum moves between concepts and as students encounter problem solving tasks.

#### **What we do:**

We prepare students for the OCR two year Further Mathematics A-level course – Year 13 students take Year 1. Students must also take the two year Mathematics A-level course. OCR split the curriculum between Year 1 and Year 2 and we follow this split. We arrange the topics within each year based on our longer-term experiences teaching A-level Further Maths using two different teachers (sometimes three). Whilst all students start the course aiming to complete the full two years we also offer the option of an AS Level after one year. We offer the course to students with a Grade 8+ at GCSE (normally a Grade 9).

#### **Why we do this:**

Having two or three teachers teach the course is more robust than just having one teacher.

We arrange the topics to offer variety as well as increasing the level of difficulty in many later topics. They build on previous knowledge and this necessitates such sequencing and promotes retrieval.

We have an entry requirement for the course as we know from national figures that students who are below this threshold tend not to succeed.

Some centres run A-level Mathematics in Year 1 and then Further Mathematics in Year 2. This makes sequencing easier. We, however, prefer to run the A-level Mathematics alongside A-level Further Mathematics as this allows students the options of either dropping Further Mathematics after one year (to end up with a full Maths A-level and a Further Maths AS Level), or dropping Further Mathematics altogether during Year 1. The reasons given for such decisions is normally the level of difficulty of the course or the workload resulting from taking four A-levels.

We offer Further Mathematics as students taking many STEM degrees, especially at the most sought after institutions, benefit from having taken A-level Further Mathematics.

Methods of deepening and securing knowledge:	
Spaced practice	Nearly all topics are visited on more than one occasions throughout the two years of maths provision. This is sometimes to re-visit topics in preparation for assessments. On other occasions it is to prepare for the learning of deeper and more challenging learning within the same concept area.
Retrieval practice	Most topics build on previous topics that are revisited as part of the new learning. The regular topic assessments and frequent, larger, Aiming High assessments require a similar revisiting of previous understanding.
Interleaving	Most topics are visited on multiple occasions throughout the two years of maths provision as they linked to new areas of learning and other concepts that are brought together in larger assessments. There are also concepts that occur in different subjects across the school that link the maths curriculum with the curriculum of other subjects across the school.
Concrete examples	There are many abstract concepts taught throughout the maths curriculum. In the teaching of many of these, concrete examples are used either to make them more accessible or because of the requirements of assessments.
Dual coding	Students will encounter many examples of graphical or diagrammatic representations of numbers and mathematical concepts.

	Autumn term 1	Autumn term 2	Spring term 1	Spring term 2	Summer term 1	Summer term 2
Topic(s)	<b>Pure</b> - Integration - Differential Equations - Partial Fractions - Linear Equations - Hyperbolic Functions - Trigonometry and Hyperbolic - 1 <sup>st</sup> Order Differential Equations		<b>Pure</b> - Polar Coordinates - Maclaurin Series - Series - Induction - Complex Numbers  <b>Mechanics</b>			

	<ul style="list-style-type: none"> <li>- 2<sup>nd</sup> Order Differential Equations</li> <li>- Linked Differential Equations</li> </ul> <p><b>Mechanics</b></p> <ul style="list-style-type: none"> <li>- Projectiles</li> <li>- Force as a Vector</li> <li>- Force in Context</li> <li>- Moments</li> <li>- Vectors</li> <li>- Work and Energy</li> <li>- Momentum</li> </ul> <p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>- Trigonometry</li> <li>- Parametric Equations</li> <li>- Proof</li> <li>- Conditional Probability</li> <li>- The Normal Distribution</li> <li>- Hypothesis Testing</li> <li>- Continuous RVs</li> </ul>		<ul style="list-style-type: none"> <li>- Circular Motion</li> <li>- Centre of Mass</li> <li>- Statics</li> <li>- Differential Equations</li> <li>- SHM</li> </ul> <p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>- Linear Combinations</li> <li>- Sampling</li> <li>- Normal Distributions</li> <li>- Theoretical Distributions</li> <li>- Non-Parametric Tests</li> </ul>			
Assessment	- Topic Reviews	- Topic Reviews - Aiming High 1 Assessment	- Topic Reviews	- Topic Reviews - Aiming High 2 Assessment	- Topic Reviews	- Topic Reviews - Aiming High 3 Assessment
CEIAG <i>(Careers that are linked to that topic)</i>	<p>The progress of students is regularly monitored and reported. This feeds in to the on-going monitoring of students' progress across all subjects and links with helping students with the transition arrangements for beyond Year 13 (typically this is university).</p> <p>The maths curriculum helps students develop skills in logical thinking, problem-solving and decision-making, which are valued by employers across many job sectors.</p> <p>Careers directly related to the maths curriculum are actuarial analyst, actuary, chartered accountant, chartered certified accountant, data analyst, investment analyst, research scientist (maths), secondary school teacher, statistician and systems developer. Careers in which the Maths curriculum is useful include Civil Service fast streamer, financial manager, accountant, financial trader, insurance underwriter, meteorologist, operational researcher, quantity surveyor, and software tester.</p> <p>Further Maths gives students a significant advantage when applying for STEM degrees at many top universities.</p>					

#### Independent Learning:

Regular independent learning is set to establish, reinforce, and revisit key concepts throughout the course.

Revision tasks are set on the run up to the Aiming High (AH) assessments.

Some Topic Reviews are done at home as part of independent learning or set as independent study for completion in the Study Centre.