The Mathematics Curriculum

The understanding of mathematics plays a vital role in many areas of life. We want students to leave Thomas Hardye School with the ability to understand numerical skills such as percentages, both for their own use in personal finance and their employment, and for interpreting information they may see in health information, politics, and the news. We want them to be able to calculate effectively when making decisions about their home, whether they are decorating, baking, or choosing furniture for it, so we ensure that they practise working with area, length, mass, ratio, and the various units of measurement necessary to do this confidently. We want students to understand the analysis of data that is used to back up figures quoted in daily life, from checking that a graph represents results correctly, to knowing that the results of research are not significant if you do not test a large sample.

Many students need to use maths in A Level subjects and beyond, and they will learn the skills necessary to model the behaviour of mechanical, chemical, financial and biological processes. This means that in KS4, they will need to learn to work with algebraic proportion, graphs, and quadratic, cubic, reciprocal, and exponential equations.

Studying mathematics helps to develop problem solving techniques and logical thinking that can be applied to many areas of learning and work. Students will learn how to set out a multi-stage response logically, justify their answer, and consider how changing assumptions might affect a model and its predictions.

We teach a spiral curriculum of our own design, interleaving topics throughout KS3, 4 and 5, which means that after a new topic has been introduced we return to it frequently to recap and build on knowledge; this is based on many years of work and experience, and we adapt the schemes to fit each new year group. Several topics are covered each half term, and we make links between these, particularly in year 11, when we focus on bringing together different areas of mathematics, for example, using algebra or ratio as problem-solving tools in topics such as probability, area and volume. This is to prepare students for the GCSE exams, and help them to understand that there can be different ways of approaching problems.

We follow the National Curriculum, GCSE and A Level specifications, and supplement these with additional enrichment tasks to broaden student knowledge as well as confidence in the management of personal finances; we make links in our lessons to PSHCE with topics such as compound interest and financial planning.

In year 9 we ensure that students have used a variety of pictorial representations, such as bar models and dual number lines, and can use symbols to represent data and unknowns. Our lesson content is influenced heavily by variation theory, with the use of examples and non-examples, as well as the careful choice of questions to focus on different aspects of one skill. One of the ways that we develop recall and retention is through our lesson starter activities, which are chosen to practise recently taught content, fundamental skills, or to review a set of techniques relevant to the lesson. Included within these are recall of relevant vocabulary and formulae, to promote the correct use of these.

The algebraic and geometric skills learned in earlier years are important for the development of logical processing, as well as an appreciation of construction and pattern in design and nature. The modelling aspect of mathematics studied at A Level, involves GCSE work on quadratic equations, graph sketching, proportion and rearranging formulae, and is applied to areas such as statistics, mechanics, and differential equations, which describe a wide range of real-life problems.

In years 9 to 11, there are at least three central assessments per year, with teachers choosing when additional tests would be useful for their own groups.

Year 9

In year 9, students are set into groups within each year quarter; they have seven lessons per fortnight.

We continue with the Key stage 3 curriculum that started in year 7, ensuring students are confident with standard number relationships and the pictorial representations of bar models and dual number lines used in earlier years. Students are introduced to some new areas of mathematics, such as transformations in the Cartesian plane, repeated percentage multipliers and trigonometry.

We have close links with our feeder middle schools and a group of representatives from each school meet regularly to compare progress through the content of years 7, 8 and 9. We also share teaching ideas, and carry out professional development together.

Key Stage 4

In year 10, students begin the GCSE Mathematics course, which they all study over two years. They have seven lessons a fortnight.

Students will be familiar with a lot of the content, but there are also new areas to explore, for instance, algebraic proportion and compound interest, and further trigonometry and vectors in the higher tier. There are ten sets in each pair of colleges, sets 1 – 5 work on the higher tier, sets 6 – 10 on the foundation tier. We move students between sets whenever necessary, up to January of year 11, and this ensures that all students who require access to higher tier work have the opportunity to study it.

In year 11, students continue to have eight lessons a fortnight, and most will keep the same teachers they had in year 10. We maintain a high level of challenge and rigour alongside revision for the GCSE, helping students to aim for their potential grade.

In the higher tier there is an emphasis on algebra, which is a key area for those who wish to take A Level Maths. Students sit mock exams in December and March of year 11, which helps them to reflect on the revision techniques they have used, as well as have the experience of the organisation required for sitting exams.

Sixth Form

In Year 12 we offer four courses, A Level Mathematics, A Level Further Mathematics, Core Maths, and GCSE.

A Level Mathematics is a very popular course, as it complements so many other subjects in the sixth form, and beyond; there are three elements, pure maths, statistics and mechanics. All groups have two teachers and follow the same scheme of work, with central assessments to check progress. The initial focus of the scheme of work is on pure mathematics, following on from GCSE, and introducing new concepts such as calculus and logarithms. After the first term, we start the applied mathematics content (statistics and mechanics), interweaving this with more pure mathematics, either independently, or within the applied mathematics topics.

On completion of the summer task at the start of year 12, we identify students who would benefit from additional support, and timetable extra lessons for them, adding to this group as necessary,

and removing students who have improved their work. Groups usually keep the same teachers in year 13.

Students who are particularly interested in maths can also study A Level Further Mathematics; they may also need the content of this course for their degree or apprenticeship. This is a popular option, and is essential for students applying to do competitive maths-related degrees or apprenticeships. In year 13, students can choose to take a double mechanics option, mechanics and decision, or decision and statistics, depending on their interests and needs.

For students who would like to continue their studies at a different level, we also offer Core Mathematics, which is equivalent to half an A Level (AS); this course gives students the opportunity to learn some interesting topics useful for problem solving. We also run the GCSE course, as students need to achieve at least a grade 4 in maths.

Enrichment

There are opportunities for enrichment at all levels, including UKMT Challenges, maths clubs for support with learning, and, usually, some trips to Maths Lectures. In year 12 and 13, we offer additional lessons for students wishing to apply for a maths degree, as some universities require additional exams; we also support students who have interviews for university courses or apprenticeships.

We support students who wish to enter other mathematics competitions, and we are very proud to have won the national ‘Ritangle’ competition two years in a row.

Students can attend Maths Club on Monday, Wednesday, Thursday or Friday, to get support with their studies, revise, or learn additional content. Teachers from the department also run Lego Club and Warhammer Club, which are both very popular.