Curriculum Overview

Year 10 – Mathematics 2020-2021

Rationale for Year 10 Mathematics (higher)

The KS4 National Curriculum for Mathematics states it is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality Mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject. Our aim is to develop learners that: - Have a love of maths. Acquire maths mastery skills. Are able to problem solve. Can make connections between topics, in order to deepen their understanding of mathematics. Are confident and able to take risks in their learning. Are fluent in the fundamentals of Mathematics. Can apply the skills learnt in their wider life experience. Can reason mathematically.

What will students learn and why?

Students follow the Edexcel syllabus, which adheres to guidelines set out in the national curriculum. It is the most popular Mathematics GCSE delivered in England and the clear articulation of questions is considered to meet the needs of our learners well. There are significantly increased demands of the current GCSE, in terms of its content and the associated skills and mathematical reasoning required, at both Higher and Foundation tier. The assessments will cover the following content headings: **1 Number 2 Algebra 3 Ratio, proportion and rates of change 4 Geometry and measures 5 Probability 6 Statistics**. Topics such as calculus and the area under a curve are now present at higher tier GCSE. Learners wishing to study Mathematics at A-Level are advised to target grades 7-9 at GCSE.
The higher GCSE course commences by revisiting some of the fundamentals of number, then later progressing to more complex number topics such as simplifying surds, then being able to apply advanced number skills within algebra topics e.g. calculating using the quadratic formula; as well as in shape topics e.g. writing trigonometric ratios using surds for exact trigonometric values. It is logical to sequence by first developing students' numerical fluency, then moving to fluency in other areas. Extending and formalising students' knowledge is achieved in a range of ways, with students supported through knowledge organisers.

How will students learn?

Students will learn through a range of techniques. A significant proportion of each lesson will focus on building on prior knowledge, with new concepts presented in small steps and scaffolded as required. The teacher will go through examples systematically, gradually taking away the scaffolding with each example, to model these new ideas. Students will learn to become independent learners as teachers engineer success by making each step achievable with ambitious end goals.
Dual coding is a key part of successful learning in maths, particularly within topics of statistics and geometry and measure. Exam questions that contain diagrams typically also contain a large amount of text. Students will be taught how to tackle these questions by gradually introducing text onto diagrams after learning the basic concepts. This will be delivered in conjunction with exam technique development, for example annotating a triangle as a way of accessing method marks. Flip charts are selective with information and not have any unnecessary distractions on them, in order that students can focus on the things required.
Teachers will use skilful questioning techniques to assess understanding throughout the lesson, identifying any misconceptions and ensuring that any required prior knowledge is secure before moving on. Students will then get time to practice these new ideas independently. The regular use of retrieval practice will also help inform teaching. The use of knowledge organisers as a tool for the recall of facts, for example students asked to memorise certain facts that will be tested on the next lesson e.g. to learn the first twenty square numbers; to learn basic circle formulae.
At the end of lessons, there will be an exam question on the topic, as it is important that students get experience of exam style questions prior to any exams and gain knowledge of how much time different types of question take.

The mathematics scheme of work is sequenced to provide spacing between topics, for example, students will learn how to factorise and expand quadratics in term 1, but will then revisit and build on this further in term 4 to ensure that the topic is secure before a further revisit and development in year 11.
Topics are interleaved where possible, with students being shown the links between various topics, for example fractions and ratio with probability, or sequences with substitution.

How will students be assessed?

Students will be assessed in a range of ways, using both formative and summative assessment.
Embedded into the Mathematic year 10 scheme of work is the regular use of retrieval practice. This will happen approximately once per week and will vary in form; including quizzes, paired quizzes, silent quizzes or the use of knowledge organisers. Retrieval practices are 'closed book', as it is important that teachers find out what students don't know in order to inform their teaching. These low stakes tests will only take up 10 minutes of the lesson and the answers will be displayed with the teacher going through specific questions that have caused difficulty or misconceptions identified. Throughout every mathematics lesson, teachers will regularly check for understanding for example through questioning techniques such as no hands up, 'say it again better', no opting out and whole class response (use of mini whiteboards).
After every topic, students will sit an open book test, the purpose of which is to give students experience of tackling exam style questions independently as well as to build up confidence. We also aim for these tests to train students to use their exercise books effectively, both in terms of motivating students to make high quality written notes in the lesson as well as create a useful resource for revision. The test will not last the whole lesson and the teacher will go through the test using the visualiser while students mark their answers. The test will be collected by the teacher to identify any common misconceptions that need to be addressed before progressing to the next topic. There will also be several independent closed book assessments spread across the year. For example, in the first term of Year 10 there will be a short test on two topics (Number and Algebra). In terms 2, 3 and 4 the test will be on three topics and then another, shorter test in term 5. There will also be an end of year assessment, which will be a set of past papers. This will be the first time that students complete a full set of GCSE papers, with the purpose being not only to get an accurate assessment of where students are, but also to inform interventions for the following year. It will also give students the experience of sitting a whole GCSE paper in exam conditions.

What is the aim for learners by the end of the year in comparison to the previous year?

Students will build on learning from key stage 3, further developing fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Across both tiers, there will be an emphasis on exam questions and developing exam technique.
By the end of Year 10 higher students will have learnt the following new content: use negative and fractional indices; simplify surds; rationalise the denominator; rearrange more complex formulae; factorise quadratics of the form $ax^2 + bx + c$; identify geometric and arithmetic sequences; use the difference of two squares; plot and interpret time series; construct back to back stem and leaf diagrams; use direct and inverse proportion; know the exact values of sine, cos and tan of some angles; find the equation of a line given it's gradient and one point on the line; find the gradient of a line through two points; find the gradient and length of a line segment; plot quadratic, cubic and reciprocal graphs; find equations of lines that are parallel or perpendicular to a given line; draw the graph of a circle; calculate arc length and areas of sectors; calculate volume and surface areas of cylinders, pyramids, cones and spheres; enlarge shapes by negative and fractional scale factors; use loci to solve problems; use the quadratic formula and complete the square to solve a quadratic; solve simultaneous equations with one quadratic; use set notation; tree diagrams; use Venn diagrams to calculate conditional probability; solve growth and decay problems; be able to calculate acceleration; prove shapes are congruent; use the link between length, area and volume scale factors to solve problems; solve Pythagoras and trig problems in 3D; calculate the area of a triangle; the sine and cosine rule; know the graphs of sin, cos and tan and use them to solve equations; transform trig graphs; find quartiles from a stem and leaf diagram; draw and interpret box plots; histograms; cumulative frequency diagrams; solve quadratic and cubic graphs using an iterative process; interpret graphs of inequalities.