

## Curriculum Overview

### Year 9 - Mathematics 2020-2021



#### Rationale for Year 9 Mathematics (sets X1, X2, Y1, Y2)

Mathematics 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.
- Can further develop students maths skills gained in KS1 and 2, as well as Year 7 and 8.
- 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 will follow the Kangaroo Maths syllabus, stage 9, which follows the national curriculum, as well as being a well-established course. The course aims to have: High expectations for all pupils, regardless of their prior attainment. It plans for progression using carefully structured schemes of work to plan a sequence of lessons that build on prior learning. It aims to provide inclusive, quality first teaching, including lessons designed with clear learning intentions, high demands of pupil involvement and engagement, appropriate use of teacher questioning, modelling and explaining, and regular opportunities for pupils to talk both individually and in groups. It also aims to invest in continuing professional development, with staff working collaboratively to support each other, take risks and be innovative. 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**. Students will learn new concepts and develop their mathematical language, in accordance with this stage and the national curriculum. New topics and concepts will be introduced, such as: calculate with roots and integer indices; manipulate algebraic expressions by expanding the product of two binomials; manipulate algebraic expressions by factorising a quadratic expression of the form  $x^2 + bx + c$ ; understand and use the gradient of a straight line to solve problems; solve two linear simultaneous equations algebraically and graphically; change freely between compound units; use ruler and compass methods to construct the perpendicular bisector of a line segment and to bisect an angle; solve problems involving similar shapes; calculate exactly with multiples of  $\pi$ ; Apply Pythagoras' theorem in two dimensions; use tree diagrams to list outcomes. In addition, they will also recognise, sketch and interpret graphs of quadratic functions. Students will also start with Trigonometry and begin to write algebraic proofs. Students will also do complex calculations with Upper and Lower bounds. They will study Direct and Inverse Proportion at a more advanced level, (using a formula with a constant, k), for the first time.

#### How will students learn?

Students will learn through a range of techniques, including modelling, (I do, we do, you do), in order to develop maths mastery. 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. Assessment 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. Flip charts are selective with information and not have any

unnecessary distractions on them, in order that students can focus on the things required. The regular use of retrieval practice will also help inform teaching (see below for more detail). The use of Glossary (in the middle of exercise books) 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 Pythagorean triples. At the end of lessons, there will be an exit ticket/ plenary on the topic, which students need to solve independently to check learning happened in each lesson. Teachers will unpick common misconceptions in the given topic, as identified. The mathematics scheme of work is sequenced to provide spacing between topics, for example, students will learn probability in term 2 but will then revisit and build on this further in term 5/6 to ensure that the topic is secure before a further revisit and development in year 10/11. Topics are interleaved where possible, with students being shown the links between various topics, for example fractions and ratio with probability, or algebraic equations with graphs.

How will students be assessed?

Students will be assessed in a range of ways, using both formative and summative assessment. There will be formal assessments towards the end of each term. Students will receive feedback through exit tickets, regular low stakes testing, and individual review of termly formal assessments, regular self-assessment and review during the lesson. Homework will usually be set on Mathswatch, with the occasional need for additional tasks.

Embedded into the stage 9 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 do not know in order to inform their teaching. These tasks 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 where misconceptions have been 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 stage 9 there will be a short test on two topics (Calculating and Visualising and Constructing) as well as 1 hour Assessment by the end of term 1. In terms 2, the test will be on three topics, with two topics tested in both terms 3 and 4. The end of year exam in term 5 will be two papers, in order to test both calculator and the non-calculator skills. In term 6 students will complete a final assessment on Probability and Statistics.

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

By the end of the year, students will have built on learning from Year 7 and 8, further developing fluency, mathematical reasoning and competence in solving increasingly sophisticated problems across the National Curriculum areas of number, algebra, ratio, proportion and rates of change, geometry and measures, probability and statistics. Students will be proficient in the topics outlined above, such as Pythagoras Theorem and solving linear Simultaneous Equations. Across Stage 9 there will be even greater emphasis on building independent mathematicians and on developing exam techniques needed for KS4. For example, how to break larger 'worded' tasks down into manageable parts, learning how long to spend on questions and how to maximise their marks on any given question (known as 'show your working'). The aims of this are to build confidence in the exam questions early on to the GCSE course in year 10. Students should be increasingly able to apply their mathematical knowledge wherever relevant in other subjects and in financial contexts.