Curriculum Overview – Year 13 A Level

In A Level maths, we follow the Edexcel A Level course with students sitting three external papers at the end of Year 13 (two pure papers and one statistics/mechanics paper). Students will build on knowledge gained throughout year 12 and learn new topics using their mathematical skills. The content will be split between two teachers. Each teacher will teach different topics. A Level maths is a very challenging course. Class teachers use the PLCs from each tracking cycle to inform their planning and to assess areas for improvement within their class. This informs the tasks set for homework and the topics covered in Boost and Secure over the course of the year. The end of the academic year focuses entirely on revising key topics identified in the last round of tracking in the build up to the A Level exams.

Unit Title	Learning
Half Term 1: 1) **Algebraic methods** 2) **Functions and graphs** 3) **Sequences and series** 4) **Binomial expansion**	In algebraic methods students will learn how to: • Use proof by contradiction to prove true statements • Multiple and divide two or more algebraic fractions • Add or subtract two or more algebraic fractions • Convert an expression with linear factors in the denominator into partial fractions • Convert an expression with repeated linear factors in the denominator into partial fractions • Divide algebraic expressions • Convert an improper fraction into partial fractions In the functions and graphs students will learn how to: • Understand and use the modulus function • Understand mappings and functions, and use domain and range • Combine two or more functions to make a composite function • Know how to find the inverse of a function graphically and algebraically • Sketch the graphs of the modulus functions • Apply a combination of two (or more) transformation to the same curve • Transform the modulus function

	In sequences and series students will learn how to:
	- Find the nth term of an arithmetic sequence - Prove and use the formula for the sum of the first n terms of an arithmetic series - Find the nth term of a geometric sequence - Prove and use the formula for the sum of a finite geometric series - Prove and use the formula for the sum to infinity of a convergent geometric series - Use sigma notation to describe series - Generate sequences from recurrence relations - Model real-life situations with sequences and series In binomial expansion students will learn to: - Expand brackets with a coefficient of 1 - Expand brackets without a coefficient of 1 - Use partial fractions to expand fractional expressions
Half Term 2: 1) **Radians** 2) **Trigonometric functions** 3) **Trigonometry and modelling** 4) **Parametric equations**	In radians students will learn how to: - Convert between degrees and radians and apply this to trigonometric graphs and their transformations - Know exact values of angles measured in radians - Find an arc length using radians - Find areas of sectors and segments using radians - Solve trigonometric equations in radians - Use approximate trigonometric values when θ is small In trigonometric functions students will learn how to:

	- Understand the definitions of secant, cosecant and cotangent and their relationship with to cosine, sine and tangent - Understand the graphs of secant, cosecant and cotangent and their domain and range - Simplify expressions, prove simple identities and solve equations involving secant, cosecant and cotangent - Prove and use trigonometric identities - Understand and use inverse trigonometric functions and their domain and ranges In trigonometry and modelling students will learn how to: - Prove and use the addition formula - Understand and use the double-angle formulae - Solve trigonometric equations using the double-angle and addition formulae - Prove trigonometric identities using a variety of identities - Use trigonometric functions to model real-life situations In parametric equations students will learn how to: - Convert parametric equations into Cartesian form by substitution - Convert parametric equations into Cartesian form using trigonometric identities - Understand and use parametric equations of curves and sketch parametric curves - Solve coordinate geometry problems involving parametric equations - Use parametric equations in modelling in a variety of contexts
Half Term 3: 1) **Differentiation** 2) **Numerical methods** 3) **Integration** 4) **Vectors**	In differentiation students will learn how to: - Differentiate simple trigonometric functions - Differentiate exponentials and logarithms - Differentiate functions using the chain, product and quotient rules - Differentiate more complex trigonometric functions - Differentiate parametric equations

- Differentiate functions which are defined implicitly
- Use the second derivative to describe the behaviour of a function
- Solve problems involving connected rates of change and construct simple differential equations

In numerical methods students will learn how to:
- Locate roots of f(x) = 0 by considering changes of sign
- Use iteration to find an approximation to the root of the equation f(x) = 0
- Use the Newton-Raphson procedure to find approximations to the solutions of equations of the form f(x) = 0
- Use numerical methods to solve problems in context

In integration students will learn how to:
- Integrate standard mathematical functions including trigonometric and exponential functions and use the reverse of the chain rule to integrate functions of the form f(ax + b)
- Use trigonometric identities in integration
- Use the reverse of the chain rule to integrate more complex functions
- Integrate functions by making a substitution, using integration by parts and using partial fractions
- Use integration to find the area under a curve
- Use the trapezium rule to approximate the area under a curve
- Solve simple differential equations and model real-life situations with differential equations

In vectors students will learn how to:
- Understand 3D Cartesian coordinates
- Use vectors in three dimensions
- Use vectors to solve geometric problems
- Model 3D motion in mechanics with vectors

Half Term 4:	Regression, correlation and hypothesis testing is the first topic in statistics. In regression, correlation and hypothesis testing students will learn how to:
1) **Regression, correlation and hypothesis testing** 2) **Conditional probability** 3) **The normal distribution** 4) **Moments** 5) **Forces and friction** 6) **Projectiles** 7) **Applications of forces** 8) **Further kinematics**	• Use exponential models in bivariate data • Use a change of variable to estimate coefficients in an exponential model • Calculate the product moment correlation coefficient • Carry out a hypothesis test for zero correlation

In conditional probability students will learn how to: • Use set notation in probability • Use conditional probability • Solve conditional probability problems using two-way tables and Venn diagrams • Use probability formulae to solve problems • Solve conditional probability using tree diagrams

Normal distribution is the last statistics topic. In normal distribution students will learn how to: • Understand the normal distribution and the characteristics of a normal distribution curve • Find percentage points on a standard normal curve • Calculate values on a standard normal curve • Find unknown means and/or standard deviations for a normal distribution • Approximate a binomial distribution using a normal distribution • Select appropriate distributions and solve real-life problems in context • Carry out a hypothesis test for the mean of a normal distribution

Moments is the first mechanics topic. In moments students will learn how to: • Calculate the turning effect of a force applied to a rigid body • Calculate the resultant moment of a set of forces acting on a rigid body |

- Solve problems involving uniform rods in equilibrium
- Solve problems involving non-uniform rods
- Solve problems involving rods on the point of tilting

In forces and friction students will learn how to:
- Resolve forces into components
- Use the triangle law to find a resultant force
- Solve problems involving smooth or rough inclined planes
- Understand friction and the coefficient of friction
- Use $F \leq \mu R$

In projectiles students will learn how to:
- Model motion under gravity for an object projected horizontally
- Resolve velocity into components
- Solve problems involving particles projected at an angle
- Derive the formulae for time of flight, range and greatest height, and the equation of the path of a projectile

In applications of forces students will learn how to:
- Find an unknown force when a system is in equilibrium
- Solve statics problems involving weight, tension and pulleys
- Understand and solve problems involving limiting equilibrium
- Solve problems involving motion on rough or smooth inclined planes
- Solve problems involving connected particles that require the resolution of forces

Further Kinematics is the last topic in mechanics. In further kinematics students will learn how to:
- Work with vectors for displacement, velocity and acceleration when using the vector equations of motion

	• Use calculus with harder functions of time involving variable acceleration • Differentiate and integrate vectors with respect to time

How can parents best support? (please can this paragraph just be put at the end – it doesn't vary for each topic)
Parents can best support their students during their time studying KS5 maths by encouraging them to complete all homework set. Students will be given a 'Personal Learning Checklist' after every round of tracking exams that they sit. These highlight key topics that your child needs to work on based on their exam. Encouraging your child to use Hegarty maths, revision websites, YouTube, revision guides to study (these will be provided) and revise topics at home will greatly benefit them. Where possible if you could purchase a scientific calculator for your child, this will help enable them to familiarise themselves with using their own calculator, enable them to answer questions in the calculator exam booklets and revise properly.