

Curriculum Overview – Year 12 A Level

In A Level maths, we follow the Edexcel A Level course with students sitting two internal papers at the end of Year 12 (one pure paper and one statistics/mechanics paper). The start of year 12 will focus on topics learnt at GCSE. This gives students the opportunity to recap and consolidate skills they will need throughout the whole A Level course. Over time, students will start to either build on previous knowledge or learn completely new content. 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 As level exams.

Unit Title	Learning
<p><u>Half Term 1:</u></p> <ol style="list-style-type: none"> 1) Algebraic expressions 2) Quadratics 3) Equations and inequalities 4) Graphs and transformations 5) Equations of straight lines 6) Circles 	<p>In algebraic expressions students will learn how to:</p> <ul style="list-style-type: none"> • Multiply and divide integer powers • Expand a single term over brackets and collect like terms • Expand the product of two or three expressions • Factorise linear, quadratic and simple cubic expressions • Use the laws of indices • Simplify and use the rules of surds • Rationalise denominators <p>In quadratics students will learn how to :</p> <ul style="list-style-type: none"> • Solve quadratic equations using factorisation, the quadratic formula and completing the square • Read and use $f(x)$ notation when working with functions • Sketch the graphs and find the turning point of a quadratic function • Find and interpret the discriminant of a quadratic expression • Use and apply model that involve quadratic functions <p>In equations and inequalities students will learn how to:</p>

- Solve linear simultaneous equations using elimination or substitution
- Solve simultaneous equations: one linear and one quadratic
- Interpret algebraic solutions of equations graphically
- Solve linear inequalities
- Solve quadratic inequalities
- Interpret inequalities graphically
- Represent linear and quadratic inequalities graphically

In graphs and transformations students will learn how to:

- Sketch cubic graphs
- Sketch quartic graphs
- Sketch reciprocal graphs
- Use intersection points of graphs to solve equations
- Translate graphs
- Sketch graphs
- Transform graphs of unfamiliar functions

In straight line graphs students will learn how to:

- Calculate the gradient of a line joining a pair of points
- Understand the link between the equation of a line, and its gradient and intercept
- Find the equation of a line given the gradient and one point on the line or two points on the line
- Find the point of intersection for a pair of straight lines
- Use the rules for parallel and perpendicular gradients
- Solve length and area problems on coordinate grids
- Use straight line graphs to construct mathematical models

	<p>In circles students will learn how to:</p> <ul style="list-style-type: none"> • Find the midpoint of a line segment • Find the equation of the perpendicular bisector to a line segment • Find the equation of a circle • Solve geometric problems involving straight lines and circles • Use circle properties to solve problems on coordinate grids • Find the angle in a semicircle and solve other problems involving circles and triangles
<p><u>Half Term 2:</u></p> <ol style="list-style-type: none"> 1) Algebraic methods 2) The binomial expansion 3) Trigonometric ratios 4) Trigonometric identities and equations 5) Vectors 	<p>In algebraic methods students will learn how to:</p> <ul style="list-style-type: none"> • Cancel factors in algebraic fractions • Divide a polynomial by a linear expression • Use the factor theorem to factorise a cubic expression • Construct mathematical proofs using algebra • Use proof by exhaustion and disproof by counter-example <p>In the binomial expansion students will learn how to:</p> <ul style="list-style-type: none"> • Use Pascal's triangle to identify binomial coefficients and use them to expand simple binomial expressions • Use combinations and factorial notation • Use the binomial expansion to expand brackets • Find individual coefficients in a binomial expansion • Make approximation using the binomial expansion <p>In trigonometric ratios students will learn:</p> <ul style="list-style-type: none"> • Use the cosine rule to find a missing side or angle

- Use the sine rule to find a missing side or angle
- Find the area of a triangle using an appropriate formula
- Solve problems involving triangles
- Sketch the graphs of the sine, cosine and tangent functions
- Sketch simple transformations of these graphs

In trigonometric identities and equations students will learn how to:

- Calculate the sine, cosine and tangent of any angle
- Find the exact trigonometric ratios for 30° , 45° and 60°
- Use the relationships and identities for \tan , \sin and \cos
- Solve simple trigonometric equations
- Solve more complicated trigonometric equations
- Solve trigonometric equations that produce quadratics

Vectors is the last pure topic student will learn in year 12. In vectors students will learn how to:

- Use vectors in two dimensions
- Use column vectors and carry out arithmetic operations on vectors
- Calculate the magnitude and direction of a vector
- Understand and use position vectors
- Use vectors to solve geometric problems
- Understand vector magnitude and use vectors in speed and distance calculations
- Use vectors to solve problems in context

Half Term 3:

- 1) Differentiation**
- 2) Integration**
- 3) Exponentials and logarithms**

In differentiation students will learn how to:

- Find the gradient at a particular point on a curve
- Find the derivative from first principles
- Find the derivative of a simple function
- Find the derivative of a quadratic function
- Find the derivative of a function with two or more terms
- Use the derivative to solve problems involving gradients, tangents and normal
- Identify increasing and decreasing functions
- Find the second order derivative of a simple function
- Find stationary points of functions and determine their nature
- Sketch the gradient function of a given function
- Model real-life situations with differentiation

In integration students will learn how to:

- Find the integral of simple functions
- Integrate polynomials
- Find $f(x)$, given $f'(x)$ and a point on the curve
- Evaluate a definite integral
- Find the area bounded by a curve
- Find the area bounded by the x-axis
- Find areas bounded by curves and straight lines

In exponentials and logarithms students will learn how to:

- Sketch exponential graphs and transformations of these graphs
- Differentiate exponentials and understand why this result is important
- Use and interpret models that use exponential functions

	<ul style="list-style-type: none"> • Recognise the relationship between exponents and logarithms • Recall and apply the laws of logarithms • Solve exponential equations • Describe and use the natural logarithm function • Use logarithms to estimate the values of constants in non-linear models
<p>Half Term 4:</p> <ol style="list-style-type: none"> 1) Data collection 2) Measures of location and spread 3) Representations of data 4) Correlation 5) Probability 6) Statistical distributions 7) Hypothesis testing 	<p>Data collection is the first topic that students will complete in statistics. Students will learn how to:</p> <ul style="list-style-type: none"> • Understand 'population', 'sample' and 'census', and comment on the advantages and disadvantages of each • Understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling and opportunity sampling • Define qualitative, quantitative, discrete and continuous data, and understand grouped data • Understand the large data set and how to collect data from it, identify types of data and calculate simple statistics <p>In measures of location and spread students will learn how to:</p> <ul style="list-style-type: none"> • Calculate measures of central tendency such as the mean, median and mode • Calculate measures of location such as percentiles and deciles • Calculate measures of spread such as range, interquartile range and interpercentile range • Calculate variance and standard deviation • Use coding <p>In representations of data students will learn how to:</p> <ul style="list-style-type: none"> • Identify outliers in data sets • Draw and interpret box plots • Draw and interpret cumulative frequency diagrams • Draw and interpret histograms • Compare two data sets

In correlation students will learn how to:

- Draw and interpret scatter diagrams for bivariate data
- Interpret correlation and understand that it does not imply causation
- Interpret the coefficients of a regression line equation for bivariate data
- Understand when you can use a regression line to make predictions

In Probability students will learn how to:

- Calculate probabilities for single events
- Draw and interpret Venn diagrams
- Understand mutually exclusive and independent events, and determine whether two events are independent
- Use and understand tree diagrams

In statistical distributions students will learn how to:

- Understand and use simple discrete probability distributions including the discrete uniform distribution
- Understand the binomial distribution as a model and comment on appropriateness
- Calculate individual probabilities for the binomial distribution
- Calculate cumulative probabilities for the binomial distribution

Hypothesis testing is the last topic in statistics for year 12. Students will learn how to:

- Understand the language and concept of hypothesis testing
- Understand that a sample is used to make an inference about a population
- Find critical values of a binomial distribution using tables
- Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results
- Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results

Half Term 5:

- 1) Modelling in mechanics**
- 2) Constant acceleration**
- 3) Forces and motion**
- 4) Variable acceleration**

Modelling in mechanics is the first topic that students will complete in mechanics. Students will learn how to:

- Apply the concept of a mathematical model to mechanics
- Apply some of the common assumptions used in mechanical models
- Know SI units for quantities and derived quantities used in mechanics
- Know the difference between scalar and vector quantities

In constant acceleration students will learn how to:

- Use and interpret displacement-time graphs
- Use and interpret velocity-time graphs
- Derive the constant acceleration formulae and use them to solve problems
- Use the constant acceleration formulae to solve problems involving vertical motion under gravity

In forces and motion students will learn how to:

- Draw force diagrams and calculate resultant forces
- Understand and use Newton's first law
- Calculate resultant forces by adding vectors
- Understand and use Newton's second law, $F=ma$
- Apply Newton's second law to vector forces and acceleration
- Understand and use Newton's third law
- Solve problems involving connected particles

Variable acceleration is the last topic in mechanics for year 12. Students will learn how to:

- Understand that displacement, velocity and acceleration may be given as functions of time
- Use differentiation to solve kinematics problems
- Use calculus to solve problems involving maxima and minima
- Use integration to solve kinematics problems

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| | <ul style="list-style-type: none">• Use calculus to derive constant acceleration formulae |
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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.