**Subject: Mathematics**

**Qualification: A level**

**Course overview**

Students will build and extend their skills and techniques from GCSE. It enables them to understand mathematics in a way that promotes confidence, fosters enjoyment and provides a strong foundation for progress to further study. Students will study Pure Mathematics including algebra, trigonometry and calculus (66.67% of the qualification) and Applied Mathematics comprising of statistics and mechanics (33.33% of the qualifications) which will show how different areas of mathematics are connected and how they relate to other disciplines, the world of work and to situations in society in general.

**How is the course assessed?**

Grades A* – E awarded. Assessment consists of three externally-examined papers that carry equal weight: Papers 1 and 2-Pure Mathematics and Paper 3- Statistics and Mechanics.

**Where can A level mathematics take you?**

Completion of this qualification will give between 16 and 56 UCAS points, to gain entry onto a degree course or entry into the workplace. Mathematics can lead to further study and careers including accountancy, engineering, medicine and teaching.

**Case Study**

| Year Group and Term | Subject Knowledge | Assessment | Curriculum/CIAG Links |
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| **Year 12 Term 1** | **Applied**<br>1. Data Collection – sampling, types of data, large data set | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge | **Applied and Pure**<br>Links to data handling content in GCSE |

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| | 2. Measures of location and spread – averages, range, variance and standard deviation<br><br>**Pure**<br>1.1 Index Laws<br>1.2 Expand bracket<br>1.3 Factorising<br>1.4 Negative and Fractional indices<br>1.5 Surds<br>1.6 Rationalise denominator Quadratics<br>2.1 Solve quadratics<br>2.2 complete the square<br>2.3 Functions<br>2.4 Quadratic graphs<br>2.5 The discriminant<br>2.6 Modelling with quadratics<br>3 Equations & inequalities<br>3.1 Linear simultaneous equations<br>3.2 Quadratic simultaneous equations<br>3.3 Simultaneous equations on graphs<br>3.4 Linear inequalities<br>3.5 Quadratic inequalities<br>3.6 Inequalities on graph<br>3.7 Region | Past paper questions every 2 weeks<br>Unit tests at the end of each chapter | |
| **Year 12 Term 2** | **Applied**<br>3. Representations of data – box plots, cumulative frequency, histograms | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge | **Applied and Pure**<br>Links to data handling content in GCSE |

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| | 4. Correlation – scatter graphs, measures of correlation, linear regression<br><br>**Pure**<br>4. Graphs & transformations<br>4.1 Cubic Graphs<br>4.2 Quartic graphs<br>4.3 Reciprocal graphs<br>4.4 Point of intersection<br>4.5 Translating graphs<br>4.6 Sketching Graphs<br>4.7 Transforming functions<br>5. Straight line graphs<br>5.1 y = mx + c<br>5.2 Equation of straight line<br>5.3 Parallel and perpendicular lines.<br>5.4 Length and area<br>5.5 Modelling with straight lines<br>6.1 Midpoint and perpendicular bisector<br>6.2 Equation of circles<br>6.3 intersections of straight lines and circles<br>6.4 Use tangent and chord properties<br>6.5 circles and triangles | Past paper questions every 2 weeks<br>Unit tests at the end of each chapter<br>November Test | |
| **Year 12 Term 3** | **Applied**<br>5. Probability – Venn diagrams, Tree diagrams<br>6. Statistical Distributions – Binomial distribution, cumulative distributions | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks | **Applied and Pure**<br>Links to probability content in GCSE |

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| | **Pure**<br>7.1 Algebraic Fractions<br>7.2 Dividing Polynomials<br>7.3 Factor Theorem<br>7.4 Mathematical Proof<br>7.5 Methods of Proof<br>8 The binomial expansion<br>8.1 Pascal's Triangle<br>8.2 Factorial notation<br>8.3 Binomial distribution<br>8.4 Solving Binomial Problems<br>8.5 Binomial Estimation | Unit tests at the end of each chapter | |
| **Year 12 Term 4** | **Applied**<br>7. Hypothesis Testing – Finding critical values, one and two tailed tests<br>8. Modelling in mechanics – modelling assumptions, vectors<br>9. Constant Acceleration – velocity time graphs, constant acceleration formulae, vertical motion<br><br>**Pure**<br>9.1 Cosine rule<br>9.2 Sine rule<br>9.3 Area of triangles<br>9.4 Solving triangular problems<br>9.5 Graphs of Sine, cosine and tangent.<br>9.6 Transforming trigonometric graphs<br>10 Trigonometric Identities & equations | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks<br>Unit tests at the end of each chapter<br>Spring Test | **Applied and Pure**<br>7. Links to Chapter 6<br>8/9 - Link to GCSE Physics, use of suvat formulae in GCSE maths for substitution and rearrangement |

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| | 10.1 Angles in all four quadrants<br>10.2 Exact values of trigonometric<br>10.3 Trigonometric identities<br>10.4 Simple trigonometric equations<br>10.5 Harder trigonometric equations<br>10.6 Equations and Identities | | |
| **Year 12 Term 5** | **Applied**<br>10. Forces and Motion – Forces and acceleration, connected particles, pulleys<br><br>**Pure**<br>11.1 Vectors<br>11.2 presenting vectors<br>11.3 Magnitude and Direction<br>11.4 Position Vector<br>11.5 Solving geometrical problems<br>11.6 Modelling with Vectors<br>12 Differentiation<br>12.1 Gradients of curves<br>12.2 Finding the 1st derivative<br>2.3 Differentiation<br>12.4 Differentiating quadratics<br>12.5 Differentiating functions with two or more terms<br>12.6 Gradients, tangents and normal<br>12.7 Increasing and decreasing functions<br>12.8 Second order derivatives<br>12.9 Stationary point<br>12.10 Sketching gradient functions | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks<br>Unit tests at the end of each chapter | **Applied and Pure**<br>Link to GCSE Physics and chapter 8 |

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| | 12.11 Modelling with differentiation | | |
| **Year 12 Term 6** | **Applied**<br>11. Variable Acceleration – using differentiation and integration, maxima and minima problems<br><br>**Pure**<br>13.1 Integrating<br>13.2 Indefinite Integrals<br>13.3 Finding Function<br>13.4 Definite Integrals<br>13.5 Areas under curves<br>13.6 Areas under the x- axis<br>13.7 Areas between curves and lines<br>14 Exponentials & Logarithms<br>14.1 Exponential functions<br>14.2 More Exponents<br>14.3 Exponential modelling<br>14.4 Logarithms<br>14.5 Laws of Logarithms<br>14.6 Solving equations using logarithms<br>14.7 Working with natural logarithms<br>14.8 Logarithms and non- linear data | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks<br>Unit tests at the end of each chapter<br>End of Year Exam | **Applied and Pure**<br>Link to chapter 10 and Pure chapters 12 and 13 |
| **Year 13 Term 1** | **Applied**<br>1. Regression, correlation and hypothesis testing – exponential models, correlation, hypothesis testing for correlation. | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge | **Applied and Pure**<br>1. Link to Y12 chapter 4<br>2. Link to Y12 chapter 5 |

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| | 2. Conditional Probability – set notation, conditional probability in venn diagrams and tree diagrams, probability formulae<br><br>**Pure**<br>1 Algebraic method<br>1.1 Proof by contradiction<br>1.2 Algebraic fraction<br>1.3 Partial fractions<br>1.4 Repeated factors<br>1.5 Algebraic division<br>2 Functions and graphs<br>2.1 The modulus functions<br>2.2 Functions and mappings<br>2.3 Composite function<br>2.4 Inverse function<br>2.5Inverse and composite functions<br>2.6 Combining transformation<br>2.7 Solving modulus problems<br>3 Sequences and Series<br>3.1 Arithmetic sequences<br>3.2 Arithmetic series<br>3.3 Geometric series<br>3.4 Sum to infinity<br>3.5 Sigma notation<br>3.6 Recurrence relations<br>3.7 Modelling with series | Past paper questions every 2 weeks<br>Unit tests at the end of each chapter | |
| **Year 13 Term 2** | **Applied** | **Applied and Pure** | **Applied and Pure** |

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| | 3. The normal distribution – finding probabilities, finding mean and standard deviation, approximating a binomial distribution, hypothesis testing.<br>4. Moments – resultant moments, equilibrium, centres of mass, tilting<br><br>**Pure**<br>4 Binomial expansion<br>4.1 Expanding (1 + ax)!<br>4.2 Expanding (b + ax)!<br>4.3 Using partial fractions<br>5 Radians<br>5.1 Radian measure<br>5.2 Arc length<br>5.3Areas of sectors and segments<br>5.4 Solving trigonometric equations<br>5.5 Small angle approximations<br>6 Trigonometric functions<br>6.1 Secant, cosecant, cotangent<br>6.2 Graphs of sec x, cosec x, and cot x<br>6.3 Using sec x, cosec x, and cot x<br>6.4 Trigonometric identities<br>6.5 Inverse trigonometric functions | Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks<br>Unit tests at the end of each chapter<br>November Mock | 3. Link to Y12 chapter 6/7<br>4. Link to Y12 chapter 10 |
| **Year 13 Term 3** | **Applied**<br>5. Forces and friction – resolving forces, inclined planes, friction | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge | **Applied and Pure**<br>5. Link to Y12 chapter 10<br>6. Link to Y12 chapter 9 |

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| | 6. Projectiles – horizontal projection, projection at an angle, projectile motion formulae.<br><br>**Pure**<br>7 Trigonometry and Modelling<br>7.1 Addition formulae<br>7.2 Using the angle addition formulae<br>7.3 Double-angle Formulae<br>7.4 Solving trigonometric equations<br>7.5 Simplifying a cos (x) ± b sin (x)<br>7.6 Proving trigonometric identities<br>7.7 Modelling with trigonometric functions 8 Parametric Equations<br>8.1 Parametric Equations<br>8.2 Using trigonometric identities<br>8.3 Curve sketching<br>8.4 Points of intersection<br>8.5 Modelling with Parametric Equations<br>9 Differentiation<br>9.1 Differentiating sin (x) and cos (x)<br>9.2 Differentiating exponentials and logarithms 9.3 The chain rule<br>9.4 The product rule<br>9.5 The quotient rule<br>9.6 Differentiating trigonometric functions<br>9.7 Parametric Differentiation<br>9.8 Implicit differentiation<br>9.9 Using second derivative<br>9.10 Rates of change | Past paper questions every 2 weeks<br>Unit tests at the end of each chapter | |

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| **Year 13 Term 4** | **Applied**<br>7. Applications of forces – modelling with static particles, friction, dynamics and inclined planes<br>8. Further Kinematics – vectors in kinematics, differentiating and integrating vectors.<br><br>**Pure**<br>10 Numerical Methods<br>10.1 Locating roots<br>10.2 Iteration<br>10.3 The NewtonRaphson method<br>10.4 Applications to modelling<br>11 Integration<br>11.1 Integrating standard functions<br>11.2 Integrating f(ax + b)<br>11.3 Using trigonometric Identities<br>11.4 Reverse chain rule<br>11.5 Integration by substitution<br>11.6 Integration by parts<br>11.7 Partial fractions<br>11.8 Finding areas<br>11.9 The trapezium rule<br>11.10 Solving differential equations<br>11.11 Modelling with differential equations<br>11.12 Integration as the limit of a sum<br>12 Vectors<br>12.1 3D coordinates | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every 2 weeks<br>Unit tests at the end of each chapter<br>Spring Mock | **Applied and Pure**<br>7. Link to Y12 chapter 10 and Y13 chapter 5<br>8. Link to Y12 chapters 9 and 11 and Y13 6 and 7 |

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| | 12.2 Vectors in 3D<br>12.3 Solving geometric problems 1<br>2.4 Application to mechanics | | |
| **Year 13 Term 5** | **Applied and Pure**<br>Revision/Preparation for final examination | **Applied and Pure**<br>Homework questions to practice and reinforce skills and knowledge<br>Past paper questions every two weeks | **Applied and Pure**<br>Year 12 and 13 practice papers |
| **Year 13 Term 6** | N/A | N/A | N/A |

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