# KS5 MATHS

| YEAR GROUP | HALF TERM 1 | HALF TERM 2 | HALF TERM 3 | HALF TERM 4 | HALF TERM 5 | HALF TERM 6 |
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| **Y12** | | | | | | |
| **KNOWLEDGE** | Introduction<br>Algebra<br>Algebra and Quadratics<br>Quadratics, Equations and Inequalities<br>Equations and Inequalities<br>Graphs and Transformations<br>Graphs and Straight Lines<br>Straight Lines<br>Binomial Expansion<br>Circles<br>Algebraic Methods<br>AP1 REVISION<br>AP1 ASSESSMENT WEEK & REVISION<br>Differentiation<br>Differentiation | Topic<br>Introduction<br>Data Collection<br>Data Collection<br>Measures of Location and Spread<br>Measures of Location and Spread<br>Representation<br>Representation<br>Correlation and Probability<br>Probability<br>Probability & Statistical Distributions<br>Statistical Distributions<br>AP1 REVISION<br>Hypothesis Testing<br>Hypothesis Testing | Topic<br>Revision Unit 1 to 8<br>Revision Unit 1 to 8 + 12<br>Differentiation and Vectors<br>Vectors<br>Trigonometric Ratios<br>Trigonometric Equations<br>Integration<br>Integration<br>Exponentials and Logs<br>AP2 ASSESSMENT WEEK & REVISION<br>Exponentials and Logs | Hypothesis Testing<br>Hypothesis Testing<br>Modelling in Mechanics<br>Constant Acceleration<br>Constant Acceleration<br>Constant Acceleration and Forces of Motion<br>Forces of Motion<br>Forces of Motion<br>Forces of Motion<br>AP2 ASSESSMENT WEEK & REVISION<br>Forces of Motion and<br>Variable Acceleration | Topic<br>Variable Acceleration<br>Assessment practice under time conditions<br>Revision applied based on topics from assessement<br>Marking and feedback | Topic<br>Ap3 assessment week & revision<br>work experience<br>Regression,correlation and testing<br>Correlation and conditional probability |
| **SKILLS** | To be able to understand and use the laws of indices for all rational exponents (C.)<br>To be able to manipulate polynomials algebraically, including expanding brackets and collecting like terms.(C.)<br>To be able to factorise linear and quadratic expressions. (C.)<br>To be able to work with negative and fractional indices. (C.)<br>To be able to use and manipulate surds (C.)<br>To be able to use and manipulate surds, including rationalising the denominator. (C.)<br>To be able to solve quadratic equations by factorising or by using the quadratic formula. (C.)<br>To be able to complete the square of a quadratic expression. (C.)<br>To be able to work out f(a) for any quadratic equation and operate with function notation. (C.)<br>To be able to solve simultaneous equations in two variables by elimination and by substitution. (C.)<br>To be able to solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation (C.)<br>To be able to solve simultaneous equations graphically. (C.)<br>To be able to solve linear inequalities, including inequalities with brackets and fractions. (C.)<br>To be able to solve and represent quadratic inequalities, such as y > ax² + bx + c (C.)<br>To be able to represent linear and quadratic inequalities such as y > x + 1 and y > ax² + bx + c graphically. (C.)<br>To be able to use shading on graphs to identify regions by using dotted and solid lines as required. (C.)<br>To be able to sketch simple cubic functions (C.)<br>To be able to sketch simple quartic functions (C.)<br>To be able to sketch reciprocal graphs, including their vertical and horizontal asymptotes. (C.)<br>To be able to interpret algebraic solutions of equations graphically and use intersection points of graphs to solve equations. (P.)<br>To be able to sketch translations. (C.)<br>To be able to sketch stretches. (C.)<br>To be able to understand the effect of simple transformations on the graph of y = f(x), including sketching associated with such graphs. (C.)<br>To be able to calculate the gradient of a line joining a pair of points and to understand the link between the equation of a line, and its gradient and intercept | To be able to understand and use the terms 'population' and 'sample'. (C.)<br>To be able to use samples to make informal inferences about the population and to use sampling techniques such as simple random sampling, stratified sampling and systematic sampling. (C.)<br>To be able to use sampling techniques such as quota and opportunity sampling. (C.)<br>To be able to define qualitative, quantitative, discrete and continuous data. (C.)<br>To be able to understand the large data set (LDS) and how to collect data from it, identifying types of data and calculate simple statistics. (P.)<br>To be able to calculate measures of central tendency such as the mean, median and mode.(C.)<br>To be able to calculate measures of location such as percentiles and deciles. (C.)<br>To be able to calculate measures of spread such as range and interquartile range.(C.)<br>To be able to calculate variance and standard deviation. (C.)<br>To be able to understand and use coding. (C.)<br>To be able to identify outliers in data sets. (C.)<br>To be able to draw and interpret cumulative frequency diagrams. (C.)<br>To be able to draw and interpret histograms. (C.)<br>To be able to compare two data sets. (P.)<br>To be able to calculate probabilities of single events. (C.)<br>To be able to draw and interpret Venn Diagrams. (C.)<br>To be able to understand and use mutually exclusive and independent events when calculating probabilities.(C.)<br>To be able to use and understand tree diagrams. (C.)<br>To be able to understand and use simple, discrete probability distributions (calculation of mean and variance of discrete random variables is excluded) (C.)<br>To be able to understand the binomial distribution as a model and calculate individual probabilities. (C.)<br>To be able to calculate cumulative probabilities for the binomial distribution. (C.)<br>To be able to understand the language and concept hypothesis testing. (C.) | Understand and use the derivative of f(x) as the gradient of the tangent to the graph of y = f(x) at a general point (x, y). (C.)<br>To be able to find the derivative by definition- first principles - (the gradient of the tangent as a limit) (C.)<br>To be able to differentiate xn. (C.)<br>To be able to differentiate quadratic expressions. (C.)<br>To be able to differentiate functions that include two or more terms. (C.)<br>To be able to apply differentiation to find gradients, tangents and normals. (P.)<br>To be able to identify where functions are increasing or decreasing. (P.)<br>To be able to understand and use the second derivative as the rate of change of gradient. (C.)<br>To be able to calculate maxima and minima and stationary points. (C.) | To be able to use integration to solve kinematics problems. (C.)<br>Constant acceleration formulae: To be able to use calculus to derive constant acceleration formulae. (P.)<br>To be able to understand exponential models in bivariate data. (P.)<br>To be able to be able to calculate and interpret the product moment correlation coefficient. (C.)<br>To be able to carry out a hypothesis test for zero correlation. (C.)<br>To be able to understand set notation in probability. (C.)<br>To be able to understand conditional probability. (C.)<br>To be able to solve probability problems using two-way tables and Venn diagrams. (C.)<br>To be able to use formulae to solve probability problems. (P)<br>To be able to solve conditional probability problems using tree diagrams. (C.)<br>To be able to find values on a normal distribution. (C.)<br>To be able to calculate values on a standardised normal curve with mean of zero and standard deviation of one. (C.)<br>To be able to find unknowns of mean and/or standard deviation for a normal distribution. (C.)<br>To be able to approximate a binomial distribution to a normal distribution. (C.)<br>To be able to carry out a hypothesis test for the mean of a normal distribution. (C.)<br>To be able to calculate the turning effect of a force applied to a rigid body. (C.)<br>To be able to calculate the resultant moment of a set of forces acting on a rigid body. (C.)<br>To be able to solve problems in uniform rods in equilibrium. (C.)<br>To be able to solve problems involving non-uniform rods. (C.)<br>To be able to solve problems in rods on the point of tilting. (C.)<br>To be able to resolve forces into components. (C.)<br>To be able to solve problems on smooth or rough inclined planes. (C.)<br>To be able to understand friction and the coefficient of friction and to use F<= uR. (C.) | | |
| **YEAR GROUP** | **HALF TERM 1** | **HALF TERM 2** | **HALF TERM 3** | **HALF TERM 4** | **HALF TERM 5** | **HALF TERM 6** |
| **Y13** | | | | | | |
| **KNOWLEDGE** | Topic<br>Introduction<br>Algebraic Methods<br>Algebraic Methods<br>Functions and Graphs<br>Functions and Graphs<br>Graphs, Sequences and Series<br>Sequences and Series<br>Binomial expansion<br>Radians<br>Trigonometric functions<br>Trigonometry and Modelling<br>Trigonometry and Modelling | Topic<br>Introduction<br>Regression, Correlation, Testing<br>Regression,Correlation,Testing & Conditional Probability<br>Conditional Probability<br>Conditional Probability & Normal Distribution<br>Normal Distribution<br>Normal Distribution<br>Normal Distribution<br>Moments<br>Moments<br>Forces and Friction<br>Forces and Friction<br>REVISION UNIT 4 AND 5 | Parametric Equations<br>Differentiation<br>Differentiation<br>Differentiation<br>Numerical Methods<br>Integration<br>Integration<br>Integration<br>Integration<br>Vectors | Topic<br>Projectiles<br>Projectiles<br>Application of Forces<br>Application of Forces<br>Application of Forces<br>REVISION STATISTICS<br>Further Kinematics<br>Further Kinematics<br>Further Kinematics | Topic<br>Vectors<br>Assessment practise under time conditions<br>Revision pure based on topics from assessment | Topic<br>Assessment under time conditions<br>End of course |
| **SKILLS** | To be able to use proof by contradiction to prove true statements. (C.)<br>To be able to add/subtract/multiply/divide two or more algebraic fractions. (C.)<br>To be able to convert an expression with linear factors in the denominator into partial fractions. (C.)<br>To be able to convert an expression with linear factors in the denominator into partial fractions. (C.)<br>To be able to divide algebraic fractions. (C.)<br>To be able to use and understand the modulus function. (C.)<br>To be able to understanding mappings and functions and use domain and range. (C.)<br>To be able to combine two or more functions to make composite function. (C.)<br>To be able to find an inverse function algebraically and graphically. (C.)<br>To be able to sketch the graphs of the above two functions involving the modulus operation. (C.)<br>Combining transformations: To be able to apply a combination of two (or more) transformations the same curve. (C.)<br>To be able to solve equations involving the modulus function. (C.)<br>To be able to find the nth term of an arithmetic sequence. (C.)<br>To be to prove and use the formula for the sum of the first n terms of an arithmetic series. (C.)<br>To be able to find the nth term of a geometric sequence. (C.)<br>To be able to prove and use the formula for the nth term of a geometric series. (C.)<br>To be able to prove and use the formula for the sum to infinity of a geometric series. (C.)<br>To be able to use sigma summation notation to describe series. (C.)<br>To be able to generate and describe sequences using recurrence sequences. (C.)<br>To be able to model real-life situations with sequences and series. (P.)<br>To be able to expand the above for any rational constant n and determine the range of values for which the expression is valid. (C.)<br>To be able to expand the above for any rational constant n and determine the range of values for which the expansion is valid. (C.)<br>To be able to convert between radians and degrees and know the exact values of angles measured in radians. (C.)<br>Arc length: To be able to find an arc length using radians. (C.)<br>Areas of sectors and segments: To be able to find sector areas using arc lengths. (C.)<br>To be able to solve trigonometric equations in radians. (C.)<br>To be able to approximate trigonometric values when the angle is small. (C.)<br>To be able to expand fractional expressions using partial fractions and binomial expansions. (C.) | To be able to understand exponential models in bivariate data. (P.)<br>To be able to be able to calculate and interpret the product moment correlation coefficient. (C.)<br>To be able to carry out a hypothesis test for zero correlation. (C.)<br>To be able to understand set notation in probability. (C.)<br>To be able to understand conditional probability. (C.)<br>To be able to solve probability problems using two-way tables and Venn diagrams. (C.)<br>To be able to use formulae to solve probability problems. (P.)<br>To be able to solve conditional probability problems using tree diagrams. (C.)<br>To be able to understand the characteristics of a normal distribution. (C.)<br>To be able to find percentage points on a standard normal curve. (C.)<br>To be able to find values on a normal distribution. (C.)<br>To be able to calculate values on a standardised normal curve with mean of zero and standard deviation of one. (C.)<br>To be able to find unknowns of mean and/or standard deviation for a normal distribution. (C.)<br>To be able to approximate a binomial distribution to a normal distribution. (C.)<br>To be able to carry out a hypothesis test for the mean of a normal distribution. (C.)<br>To be able to calculate the turning effect of a force applied to a rigid body. (C.)<br>To be able to calculate the resultant moment of a set of forces acting on a rigid body. (C.)<br>To be able to solve problems in uniform rods in equilibrium. (C.)<br>To be able to solve problems involving non-uniform rods. (C.)<br>To be able to solve problems in rods on the point of tilting. (C.)<br>To be able to solve problems on smooth or rough inclined planes. (C.)<br>To be able to understand friction and the coefficient of friction and to use F<= uR (C.).<br>To be able to model motion under gravity when projected horizontally. (P.)<br>To be able to resolve projectile problems into horizontal and vertical components. (C.)<br>To be able to solve problems involving particles projected at any given angle to the horizontal. (C.) | To know the relation between the above and sin, cos and tan functions. (C.)<br>To be able to recognise the graphs of the above three reciprocal trigonometric functions. (C.)<br>To be able to solve equations and prove equivalences of expressions involving the above three reciprocal trigonometric functions. (C.)<br>To be able to know the definitions of the reciprocal trigonometric functions and their relation to sin, cos and tan. (C.)<br>To be able to understand inverse trigonometric functions and their domain and ranges. (C.)<br>To be able to understand and use the double angle formula. (C.)<br>Using the angle addition formulae: To be able to understand and use the addition formula. (C.)<br>To be able understand and use the double angle formula. (C.)<br>To be able to solve trigonometric equations using the double angle and addition formulae. (C.)<br>To be able to write expressions in the above form into the forms Rsin(x±a) or Rcos(x±a) (C.)<br>To be able to be able to prove trigonometric equivalences using a variety of identities covered previously in the course. (C.)<br>To be able to use trigonometric functions to model real real life situations. (P.)<br>To be able to convert parametric equations into cartesian form by using substitution. (C.)<br>To be able to convert parametric equations into cartesian form using trigonometric identities. (C.)<br>To be able to be able to sketch curves given in parametric form. (C.)<br>To be able to be able to solve coordinate geometry problems involving parametric equations. (C.)<br>To be able to use parametric equations in modelling in a variety of contexts. (C.)<br>To be able to differentiate trigonometric functions. (C.).<br>To be able to differentiate exponential and log functions. (C.). | To be able to solve problems on rough and smooth inclined planes. (C.).<br>To be able to solve problems involving connected particles that require the resolution of forces. (C.).<br>To be able to work with vectors for displacement, velocity and acceleration when using the vector equations of motion. (C.).<br>To be able to use vector methods with projectile problems. (C.).<br>To be able to use calculus with harder functions involving variable acceleration. (C.).<br>To be able to differentiate vectors with respect to time. (C.).<br>To be able to integrate vectors with respect to time. (C.).<br>To be able to find unknown forces when a system is in equilibrium. (C.).<br>To be able to solve problems with particles in equilibrium. (C.).<br>To be able to solve static problems involving: weight, tension and pulleys. (C.).<br>To be able to be able to solve problems involving limited equilibrium. (C.).<br>To be able to solve problems on rough and smooth inclined planes. (C.).<br>To be able to solve problems involving connected particles that require the resolution of forces. (C.).<br>To be able to work with vectors for displacement, velocity and acceleration when using the vector equations of motion. (C.).<br>To be able to use vector methods with projectile problems. (C.).<br>To be able to use calculus with harder functions involving variable acceleration. (C.).<br>To be able to differentiate vectors with respect to time. (C.).<br>To be able to integrate vectors with respect to time. (C.). | | A Level Exams |