CURRICULUM AND ASSESSMENT PLAN

YEAR 12 | A LEVEL MATHEMATICS

The curriculum and assessment of students at this stage of education has been carefully designed to promote deep learning of mathematics and develop students into mathematicians:

The scheme of work follows the 2017 specification from Edexcel, which builds on prior knowledge from GCSE. There are opportunities throughout to apply techniques and methods to real life modelling.

HALF TERM 1

All students will know:

PURE MATHEMATICS

Algebraic Expressions
- Index laws
- Surds
- Expanding and factorising double and triple brackets

Quadratics
- Solving via the formula, factorising and completing the square
- Using the discriminant
- Sketching quadratics
- Modelling using quadratics

Equations and Inequalities
- Linear and quadratic simultaneous equations
- Solving simultaneous equations graphically
- Linear and quadratic inequalities and regions

STATISTICS

Sampling Methods

Measures of Location and Spread
- Averages from a table
- Range, IQR and standard deviation
- Coding

Representations of Data
- Cumulative frequency and box plots
- Histograms

Correlation
- Correlation
- Linear regression

Probability
- Venn, sample space and tree diagrams

All students will be assessed:

Regular use of past paper questions on topics covered. Class assessment on all the topics covered during this half term.

Reading skills needed for this unit:

Pearson ActiveLearn ebook
CGP textbook.

Key vocabulary:

Indices, exponentials, surds, rational, irrational, factorise, expand, roots, discriminant, turning point, vertex, intercept, tangent, normal, census, statistic, parameter, central tendency, distribution, standard deviation, variance, percentiles, frequency density, sample space, event, outcome, mutually exclusive, independent, conditional.

HOW STUDENTS CAN BE SUPPORTED AT HOME

Pearson Active Learn eBooks, videos of class assessment model answers, independent study guide with suggested websites.

CURRICULUM AND ASSESSMENT PLAN

YEAR 12 | A LEVEL MATHEMATICS

ENRICHMENT OPPORTUNITIES

UKMT challenge, courses provided by AMSP, university lecture visits.

HALF TERM 2

All students will know:

PURE MATHEMATICS

Graphs and Transformations

- Sketching different types of graph
- Points of intersection
- Transformations of graphs

Straight Line Graphs

- Equations of parallel and perpendicular lines
- Modelling with straight lines

Circle Geometry

- Equations of circles
- Intersection of straight lines and circles
- Geometrical problems

STATISTICS:

Statistical Distributions

- Probability distributions
- Binomial distribution
- Cumulative probabilities

Hypothesis Testing

- Hypothesis testing with the Binomial distribution

All students will be assessed:

- Regular use of past paper questions on topics covered.
- Class assessment on all the topics covered during this half term.

Reading skills needed for this unit:

Pearson ActiveLearn eBook,CGP textbook.

Key vocabulary:

Critical value, hypothesis, significance level, confidence interval, factor theorem, factor, quotient, remainder, binomial, distribution, coefficient, polynomial, cubic, quartic, reciprocal, asymptote, translation, reflection, stretch, chord.

HALF TERM 3

All students will know:

PURE MATHEMATICS

Algebraic Methods

- Algebraic Fractions
- Dividing polynomials
- The factor theorem
- Mathematical Proof

The Binomial Expansion

- Factorial notation
- The binomial expansion
- Applications of the binomial theorem in approximations of calculations

MECHANICS

Modelling in Mechanics

- Constructing a model and assumptions
- Using vectors

Constant Acceleration in 1D

- Displacement-time and velocity-time graphs
- Equations of motion
- Motion due to gravity

All students will be assessed:

- Regular use of past paper questions on topics covered.
- Class assessment on all the topics covered during this half term.

Reading skills neededfor this unit:

Pearson ActiveLearn eBook,CGP textbook.

Key vocabulary:

Factor theorem, factor, quotient, remainder, binomial, coefficient, polynomial, cubic, quartic, modelling, inextensible, light, smooth, velocity, displacement, acceleration, projectile, equilibrium, resolve.

CURRICULUM AND ASSESSMENT PLAN

YEAR 12 | A LEVEL MATHEMATICS

ENRICHMENT OPPORTUNITIES

UKMT challenge, courses provided by AMSP, university lecture visits.

HALF TERM 4

All students will know:

PURE MATHEMATICS

Trigonometric Ratios

- Cosine rule, sine rule including ambiguous cases
- Area of any triangle
- Graphs of sine, cosine and tangent
- Transformations of trigonometric graphs

Trigonometric Identities and Equations

- Exact trigonometric values
- Trigonometric identities
- Solving linear and quadratic trigonometric equations

MECHANICS

Forces and Motion

- Force diagrams and resultant forces
- Newton's laws of motion
- Connected particles and pulleys

All students will be assessed:

» Regular use of past paper questions on topics covered.
» Class assessment on all the topics coveredduring this half term.

Reading skills needed for this unit:

Pearson ActiveLearn eBook, CGP textbook.

Key vocabulary:

Sine, cosine, tangent, asymptote, periodic, identity, force, resultant, component, magnitude,reaction, equilibrium, resolve.

HALF TERM 5

All students will know:

PURE MATHEMATICS

Vectors

- Representation, magnitude and direction
- Geometric proof using vectors
- Modelling with vectors

Differentiation

- First and second order derivatives
- Differentiation from first principles
- Gradients, tangents and normal to a curve
- Finding stationary points and determining their nature
- Sketching graphs of gradient functions
- Modelling with differentiation

MECHANICS

Variable Acceleration in 1D

- Using differentiation and integration
- Solving maxima and minima problems
- Deriving the constant acceleration formulae

All students will be assessed:

» Regular use of past paper questions on topics covered.
» Class assessment on all the topics coveredduring this half term.

Reading skills needed for this unit:

Pearson ActiveLearn eBook, CGP textbook.

Key vocabulary:

Vector, parallel, collinear, magnitude, calculus, differentiation, delta, infinite, first and second derivative, gradient, rate of change, stationary points, inflection

CURRICULUM AND ASSESSMENT PLAN

YEAR 12 | A LEVEL MATHEMATICS

ENRICHMENT OPPORTUNITIES

UKMT challenge, courses provided by AMSP, university lecture visits.

HALF TERM 6

All students will know:

PURE MATHEMATICS

Integration

Definite and indefinite integrals
Find the area under a curve and regions between curves and lines

Exponentials and logarithms

Exponential functions and their graphs
Modelling exponential growth and decay
Laws of logarithms
Solving equations involving exponentials and logarithms
The number e and natural logarithms
Proving non-linear trends using logarithms

All students will be assessed:

» Regular use of past paper questions on topics covered.

» Mock exam using AS level exam papers.

Reading skills needed for this unit:

Pearson ActiveLearn eBook, CGP textbook.

Key vocabulary:

Calculus, integration, delta, infinite integral, integrand, definite and indefinite, region, exponential, logarithm, base, growth and decay

CURRICULUM AND ASSESSMENT PLAN

YEAR 13 | A LEVEL MATHEMATICS

ENRICHMENT OPPORTUNITIES

UKMT challenge, courses offered by AMSP, university lecture visits.

The curriculum and assessment of students at this stage of education has been carefully designed to promote deep learning of mathematics and develop students into mathematicians:

Scheme of work follows the 2017 specification from Edexcel, which builds on prior knowledge from GCSE. There are opportunities throughout to apply techniques and methods to real life modelling.

HALF TERM 1

All students will know:

CORE

1) Algebraic methods:

- Use proof by contradiction to prove true statements.
- Add, subtract, multiply and divide with algebraic fractions.
- Convert a rational expression with linear factors in the denominator into partial fractions.
- Use polynomial long division.
- Convert an improper algebraic fraction into partial fraction form.

2) Functions and graphs:

- Understand mapping and functions, and use domain and range.
- Combine two or more functions to make a composite function.
- Know how to find an inverse function algebraically and graphically.
- Apply transformations and sketch graphs of functions.
- Sketch graphs and solve equations and inequalities involving the modulus function.

STATISTICS

1) Regression, correlation and hypothesis testing:

- Understand exponential models in bivariate data.
- Use a change of variable to estimate coefficients in an exponential model.
- Understand and calculate the product moment correlation coefficient.
- Carry out a hypothesis test for zero correlation.

All students will be assessed:

- Regular use of past paper questions on topics covered.
- Class assessments on all the topics covered during this half term.

Reading skills needed for this unit:

- Pearson eBook, CGP textbook.

Key vocabulary:

Proof by contradiction, statement, argument, partial fraction, function, mapping, range, domain, one-one, many-one, inverse, modulus, absolute, regression, correlation, hypothesis testing, bivariate, coefficients, product moment correlation.

CURRICULUM AND ASSESSMENT PLAN

YEAR 13 | A LEVEL MATHEMATICS

ENRICHMENT OPPORTUNITIES

UKMT challenge, courses offered by AMSP, university lecture visits.

HALF TERM 2

All students will know:

CORE

1) Sequences and series

- Find the nth term of an arithmetic and geometric sequence.
- Prove and use the formula for the sum of the first n terms of an arithmetic series.
- 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 a series.
- Generate and describe a sequence using recurrence relations.
- Model real-life situations with sequences and series.

2) Binomial expansion:

- Expanding binomials raised to any rational exponent and determine the values of x for which the expansion is valid.
- Using partial fractions with binomial expansions.

STATISTICS

1) Conditional probability:

- Understand set notation and conditional probability.
- Solve conditional probability problems using two-way tables, tree diagrams, Venn diagrams, and probability formulae.

2) The normal distribution:

- Understand the normal distributionand its characteristics.
- Calculate percentage points and valueson a standard normal curve.
- Find unknown means and/or standarddeviations for a normal distribution.
- Approximate a binomial distributionusing a normal distribution.
- Solve real-life problems usingan appropriate distribution.
- Carry out a hypothesis test ona normal distribution.

All students will be assessed:

- Regular use of past paper questions on topics covered.
- Class assessments on all content covered this term.

Reading skills needed for this unit:

Pearson eBook, CGP textbook.

Key vocabulary:

Sequence, series, iteration, inductive, convergence, divergence, sigma, summation, binomial, coefficient, partial fraction, set notation, conditional, sample space, mutually exclusive, independent, normal distribution, continuous random variable, confidence interval, hypothesis testing.

HALF TERM 3

All students will know:

CORE

1) Radian measure:

- Convert between degrees and radians and apply this to trigonometric graphs.
- Know exact values of angles measured in radians.
- Find arc lengths and areas of sectors and segments using radians.
- Solve trigonometric equations in radians.
- Using small angle approximations.

2) Trigonometric functions:

- Understand the definitions of secant, cosecant and cotangent, their graphs, and their relationship to cosine, sine and tangent.
- Simplify expressions, prove identities and solve equations involving secant, cosecant and cotangent.
- Understand and use inverse trigonometric functions and their domains and ranges.

MECHANICS

1) Moments:

- Calculate the resultant turning effectof a force or set of forces applied to a rigid body.
- Solve problems involving uniform,non-uniform rods.

- **All students will be assessed:**

  Regular use of past paper questions on topics covered.
- Class assessments on all the topics covered during this half term.

Reading skills needed for this unit:

Pearson eBook, CGP textbook.

Key vocabulary:

Radian, arc, sector, segment, sine, cosine, tangent, secant, cosecant, cotangent, inverse, interval, moments, tilting, friction, coefficient, slipping, rough, plane, equilibrium, resolve, component, resultant.

CURRICULUM AND ASSESSMENT PLAN

YEAR 13 | A LEVEL MATHEMATICS

HALF TERM 4

All students will know:

CORE

1) Trigonometry and Modelling:

» Prove and use the addition and double-angle formulae.
» Use the addition and double-angle formulae to solve equations.
» Rewrite trigonometric expressions as a single sine and cosine.
» Prove trigonometric identities.
» Model real-life situations using trigonometric functions

2) Parametric equations:

» Convert a parametric equation into Cartesian form, either by substitution or using trigonometric identities.
» Understand sketches of parametric curves, and sketch parametric curves.
» Solve coordinate geometry problems involving parametric equations.
» Use parametric equations to model real life.

3) Differentiation.

» Differentiate trigonometric functions, exponentials and logarithms.
» Differentiate using the chain, product and quotient rules.
» Differentiate parametric equations.
» Differentiate functions that are described implicitly.
» Use the second derivative to describe the behaviour of a function.
» Solve problems involving rates of change and construct simple differential equations.

MECHANICS

1) Friction and forces:

» Resolve forces into components.
» Solve problems involving smooth and rough inclined planes.
» Understand and solve problems involving friction.

2) Projectiles:

» Model motion under gravity for an object projected horizontally and an angle.
» Derive formulae for the time of flight, range and greatest height of a projectile, and the equation of the path of a projectile.

All students will be assessed:

» Class assessments on all the topics covered during this half term.
» Mock examinations using A level past papers.

Reading skills needed for this unit:

Pearson eBook, CGP textbook.

Key vocabulary:

Parametric, cartesian, exponential, logarithm, chain rule, product rule, quotient rule, implicit, explicit, roots, iteration, moments, tilting, friction, coefficient, slipping, rough, plane, equilibrium, resolve, component, resultant.

HALF TERM 5

All students will know:

CORE:

1) Numerical methods

» Locate the roots of an equation by considering changes of sign.
» Use iteration to find approximate roots of an equation.
» Use the Newton-Raphson method to find approximate roots to an equation.
» Use numerical methods to solve real-life problems.

2) Integration

» Integrate standard integrals including exponential and trigonometric functions, and use the reverse chain rule to integration functions of the form f(ax+b).
» Integrate using trigonometric identities.
» Use integration by substitution, integration by parts and using partial fractions.
» Find the area under a curve using integration.
» Find the approximate area under a curve using the trapezium rule.
» Solve simple differential equations and model real-life situations using differential equations.

3) Vectors

» Understand 3D Cartesian coordinates, and use vectors in 3D.
» Use vectors to solve geometric problems.
» Model 3D motion in mechanics using vectors.

MECHANICS

1) Application of forces:

» Find an unknown force for a system in equilibrium.
» Solve static problems involving weight, tension and pulleys.
» Solve problems involving connected particles on rough and smooth horizontal and inclined planes.

2) Further kinematics:

» Use vectors for displacement, velocity and acceleration when using equations of motion.
» Use calculus to solve problems involving variable acceleration.

All students will be assessed:

Class assessments on all the topics covered during this half term, and A-level past exam papers.

Reading skills needed for this unit:

Pearson eBook, CGP textbook.

Key vocabulary:

Standard integral, inspection, inverse chain rule, substitution, by parts, trapezium rule, differential equation, cartesian, plane, projectile, equilibrium, resolve, component, resultant.

CURRICULUM AND ASSESSMENT PLAN

YEAR 13 | A LEVEL MATHEMATICS

HALF TERM 6

All students will know:

» Revision and completion of end of course examinations.

Reading Skills needed for this unit:

» Pearson eBook, CGP textbook.

HOW THIS LEARNING WILL BE EMBEDDED ELSEWHERE IN THE CURRICULUM

A-level Physics, A-level Chemistry and A-level Biology.

HOW STUDENTS CAN BE SUPPORTED AT HOME

Pearson Active Learn e-books, videos of class assessment model answers, independent study guide with suggested websites.