YEAR 13 | A LEVEL FURTHER MATHS

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. Complex numbers:
» Exponential form of complex numbers.
» Multiply and divide with complex numbers.
» De Moivre's theorem
» Trigonometric identities
» Sum of series
» n^{th} roots of a complex number
» Geometric problems

2. Series:
» The method of differences
» Higher derivatives
» Mclaurin series
» Series expansion of compound functions

DECISION

1. The travelling salesman problem
» The classical and practical travelling salesman problems
» Using a minimum spanning tree to find upper and lower bounds
» Using the nearest neighbour algorithm to calculate an upper bound

2. The simplex algorithm
» Formulating linear programming problems
» The simplex method
» Problems requiring integer solutions
» The two-stage simplex method
» The big M method

All students will be assessed:
Class assessments on all the topics covered during this half term.
Past paper questions on topics covered.

Reading skills needed for this unit:
Pearson eBook.

Key vocabulary:
Complex, imaginary, conjugate, real, Argand diagram, argument, algorithm, modulus, loci, region, nth root, distinct root, discriminant, de Moivre, unity, exponential.
Decision variables, constraints, objective function, slack variables, Simplex method, surplus variables, artificial variables, basic and non-basic variables, Simplex tableau, feasible solution, feasible region, optimal solution, pivotal column, pivotal row, pivot, optimality condition, big-M

CURRICULUM AND ASSESSMENT PLAN
YEAR 13 | A LEVEL FURTHER MATHS

HALF TERM 2
All students will know:

CORE

3. Methods in calculus:
» Improper integrals
» The mean value of a function
» Differentiating inverse trigonometric functions
» Integrating with inverse trigonometric functions
» Integrating using partial fractions

4. Volumes of revolution:
» Volumes of revolution around the x axis
» Volumes of revolution around the y axis
» Volumes of revolution of parametrically defined curves
» Modelling with volumes of revolution

DECISION

1. Critical path analysis
» Modelling a project
» Dummy activities
» Early and late event times
» Critical activities
» The float of an activity
» Gantt charts
» Resource histograms
» Scheduling diagrams

All students will be assessed:
Class assessments on all the topics covered during this half term.
Past paper questions on topics covered.

Reading skills needed for this unit:
Pearson eBook.

Key vocabulary: Hyperbolic, sinh, cosh, tanh, domain, range, exponential, function, radical, polar, Cartesian, coordinates, convert, parallel, point, enclosed, area, volume, revolution, Gantt chart, resource histogram, float, critical, level, float

HALF TERM 3
All students will know:

CORE

5. Polar Coordinates:
» Polar coordinates and equations
» Sketching curves
» Area enclosed by a polar curve
» Tangents to polar curves

6. Hyperbolic Functions:
» Introduction to hyperbolic functions
» Inverse hyperbolic functions
» Identities and equations
» Differentiating hyperbolic functions
» Integrating hyperbolic functions

MECHANICS

1. Momentum:
» Momentum and impulse
» Conservation of momentum
» Momentum as a vector

2. Elastic strings and springs:
» Elastic strings and springs
» Hooke's Law and equilibrium problems
» Hooke's Law and dynamics problems
» Elastic Energy
» Problems involving elastic energy

All students will be assessed:
Class assessments on all the topics covered during this half term.
Past paper questions on topics covered.

Reading skills needed for this unit:
Pearson eBook.

Key vocabulary: Improper, undefined, continuous, mean, integrate, partial, fraction, radical, inverse String, spring, light, elasticity, modulus of elasticity (λ), extension, natural length, elastic potential energy (EPE), kinetic energy (KE), gravitational potential energy (GPE), joules (J), conservation of energy, equilibrium, work-energy principle, Newton's 2nd law of motion, work done, joined or parallel strings/springs, friction, coefficient of friction, inclined plane

CURRICULUM AND ASSESSMENT PLAN
YEAR 13 | A LEVEL FURTHER MATHS

HALF TERM 4
All students will know:

CORE

7. Methods in differential equations
» First order differential equations
» Second order homogeneous differential equations
» Second order non homogeneous differential equations
» Using boundary conditions

8. Modelling with differential equations
» Modelling with first order differential equations
» Simple harmonic motion
» Damped and forced harmonic motion
» Coupled first-order simultaneous differential equations

MECHANICS

3. Elastic collisions in two dimensions:
» Oblique impact with a fixed surface
» Successive oblique impacts
» Oblique impact of smooth spheres

HOW STUDENTS CAN BE SUPPORTED AT HOME
Pearson Active Learn e-books, videos of class assessment model answers, independent study guide with suggested websites.

All students will be assessed:
Class assessments on all the topics covered during this half term.
Past paper questions on topics covered.

Reading skills needed for this unit:
Pearson eBook.

Key vocabulary: Integrating, factor, complementary, function, differential, equation, order, auxiliary, discriminant, general, particular, impact, momentum, impulse, magnitude, direction, sphere, equal radii, collision, oblique, smooth, coefficient of restitution, Newton's (experimental) law of restitution, rebound, conservation, perfectly elastic, inelastic, vector, component, parallel, perpendicular, normal, line of centres, deflection, scalar product, kinetic energy.

HALF TERM 5
All students will know:

CORE
»Revision and exam preparation

DISCRETE
»Revision and exam preparation

MECHANICS
»Revision and exam preparation

All students will be assessed:
Past paper questions on topics covered.
External examinations will take place in May/June

Reading skills needed for this unit:
Pearson eBook.

Key vocabulary: