YEAR 12 A-LEVEL FURTHER MATHS CONTENT

Matrices: Add/subtract, multiply by scalar, matrix multiplication, zero and identity matrix (CP1 Ch 6)	Complex Numbers: Real and imaginary numbers, adding/subtracting/multiplying and simplifying. Solve any quadratic with real coefficients (CP1 Ch 1)
Matrices: Linear transformations, rotations and reflections (CP1 Ch 7) ASSESSMENT	Complex Numbers: complex conjugate, roots of real polynomials (CP1 Ch 1)
Invariant points and lines under linear transformation (CP1 Ch 7)	Complex Numbers: Solving problems with complex numbers, solving polynomial equations (CP1 Ch 1)
Calculate determinants of 2x2 and 3x3 matrices. Interpret as area scale factors (CP 1 Ch 6)	Complex Numbers: Argand diagrams, Cartesian and modulus-argument form (CP1 Ch 2)
Matrices: Singular and non-singular matrices. Calculating inverse matrices (CP 1 Ch 6)	Multiplying and dividing complex numbers in modulus-argument form (CP 1 Ch 2)
Matrices: Solving simultaneous equations with matrices, review (CP1 Ch 6)	Complex Numbers: Loci in Complex plane (CP1 Ch 3)
Matrices: Iinterpret geoetrically the solution and failure of the solution of three simultaneous linear equations. (CP 1 Ch 6.6)	Algorithms: flow chart, bubble sort, quicksort (D1 Ch 1)
Induction: method of induction, proving summation relations (CP1 Ch 8)	Algorithms: binary search, bin packing. Graph Theory: definitions, notation, matrix representation (D1 Ch 1/2)
Induction: divisibility relations (CP1 Ch 8)	Graph Theory: Eulerian, semi-Eulerian, complete, planar, isomorphism
Induction: matrix relations (CP1 Ch 8)	Planarity algorithm:Hamiltonian cycle
Polynomial Equations Relation between roots and coefficients of polynomial equations up to quartic (CP1 Ch4)	Algorithms on Networks: Kruskal's and Prim's, Prim's on matrix (D1 Ch 3)
Form a polynomial equation whose roots are a linear transformation of a given polynomial (CP 1 Ch 4)	Algorithm's on network: Dijkstra's shortest distance algorithm (D1 Ch 3)

Series: sigma notation, sums of r, r^2 and r^3 (CP1 Ch 3)	Algorithm's on network: Floyd's algorithm for finding the shortest path (D1 Ch 3)
Series: using known sums to find more complex sums (CP1 Ch 3)	Route Inspection: tranversable graphs, Chinese postman (shortest route) (D1 Ch 4)
Vector equations of straight lines (CP1 Ch 9)	Travelling salesman: upper and lower bounds using minmum spanning tree methds (D2 Ch 3)
Vector equations of straight lines - intersection between two lines (CP1 Ch 9)	Travelling salesman: nearest neighbour algorithm (D2 Ch 3)
Equation of a plane. Vector and Cartesian forms. (CP 1 CH 9)	Critical Path analysis: precedence tables, activity networks and dummies (D1 Ch 5)
Vectors: scalar products, angles between vectors (CP1 Ch 9)	Critical Path Analysis: identifying critical path, critical activities, floats (D1 Ch 5)
Vectors: scalar products, angles between two planes, ngle between line and plane (CP1 Ch 9)	Critical Path Analysis: constricting and using Gantt Charts; scheduling diagrams (D1 Ch 5)
Vectors: check for perpendicular lines using the scalar product (CP1 Ch 9)	Critical Path Analysis: construct resource histograms, scheduling least wrokers (D1 Ch 5)
Vectors: intersection between line and plane. Calculate perpendicular distance between two lines , point to line and point to plane. (CP1 Ch 9)	Linear Programming: formulating linear programming problems, representing problems on graphs (D1 Ch 6)
Discrete Random Variables: probabilitiy distributions, sum rules, (FS1 Ch 1)	Linear Programming: obtaining optimum point (2 methods) (D1 Ch 6)
Discrete Random Variables: expected values and variance (FS1 Ch 1)	Linear programming: integer solutions (D1 Ch 6)
Discrete Random Variables: expected values and variance of function of X (FS1 Ch 1)	Linear Programming: Formulating problems, slack variables (D2 Ch 4)

Binomial Distribution • arrangements, factorial conditions/properties of binomial distribution (STM Y1 - Ch 5)	Poisson Distribution • As a pdf (drv) Mean and variance (FS1 Ch 2)
Binomial Distribution • cumulative distribution mean and variance (STM Y1 Ch5)	Poisson Distribution • conditions/properties of poissonl distribution use of tables (FS1 Ch 2)
Geometric and negative binomial - models leading to these distributions (FS 1 Ch 3)	Poisson Distribution • applications (exam problems) approximation to Binomial - choosing correct dist (FS1 Ch 2)
Geometric and negative binomial - mean and variance of geomtric and negative binomial distribution (FS 1 Ch 3)	Poisson Distribution • applications (exam problems) approximation to Binomial - choosing correct dist (FS1 Ch 2)
Hypothesis testing • concept, significance testing, one and two tail tests (FS1 Ch 4)	Goodness of fit tests and contingency tabes: discrete, uniform, binomial, Poisson and geometric (FS1 Ch 6)
Hypothesis testing • hypothesis test with Binomial/Poisson distribution (FS1 Ch 4)	Null and alternate hypotheses - approximate chi^2 statistic (FS1 Ch 6)
Hypothesis testing • hypothesis test with geometric distribution (FS1 Ch 4)	Degrees of freedom: determine the degrees of freedom. Obtain p-values from calculator or tables to find critical values. (FS1 Ch 6)

YEAR 13 A-LEVEL FURTHER MATHS CONTENT

Complex Numbers: Euler's relation, complex exponential, multiplying and dividing (CP2 Ch 1)	Linear Programming: Formulating problems, slack variables (D1 Ch 7)
Complex Numbers: De Moivre's Theorem, trigonometric identities (CP2 Ch 1)	Linear Programming: Simplex Tableau (D1 Ch 7)
Complex Numbers: De Moivre's Theorem - sums of series (CP2 Ch 1)	Linear Programming: Simplex Tableau (D1 Ch 7)

Complex Numbers: nth roots, relation to Argand diagram (CP2 Ch 1)	Linear Programming: two step simplex and big-M methods (D1 7.4)
Complex Numbers: nth roots of unity - solve geometric problems (CP2 Ch 1)	Linear Programming: two step simplex and big-M methods (D1 7.4)
Hypothesis testing • concept, significance testing, one and two tail tests (FS1 Ch 4)	MacLaurin/Taylor Series: Finding Higher derivatives, deriving MacLaurin Series (CP2 Ch 2.2, 2.3)
Hypothesis testing • hypothesis test with Binomial/Poisson distribution (FS1 Ch 4)	MacLaurin/Taylor Series: Finding series from first principles (CP2 Ch 6)
Hypothesis testing • hypothesis test with geometric distribution (FS1 Ch 4)	MacLaurin/Taylor Series: Composite functions using known series (CP2 Ch 2.4)
Applications of the Central Limit Theorem (applied to all distributions studied) (FS1 Ch 5)	MacLaurin/Taylor Series: consolidation, exam questions - mixed exercise (CP2 Ch 2)
Definitions, derivations and applictions: negative binomial, geometric, binomial and Poisson (FS 1 Ch 7)	Understand definitions of hyperbolic functions, their domains nd ranges, and be able to sketch their graphs (CP2 Ch 6)
Use to find mean and variance, sums of distributions (FS1 Ch 7)	Inverse hyperbolic functions: domains and ranges, logarithmic form (CP2 Ch 6)
Identifying probabiity of Type 1 and Tye II errors (FS1 Ch 8)	Equations and identities with hyperbolic functions (CP2 Ch 6)
Use Type I and Type II errors to indicate effectiveness of statistical tests (all distrbutions) (FS1 Ch 8)	Differentiate and integrate hyperbolic functions (CP2 Ch 6)
Series: Method of differences (CP2 Ch 2.2)	Differentiate and integrate hyperbolic functions (CP2 Ch 6)
Second Order Differential Equations: Homogeneous equations - derive solution types (CP2 Ch 7.2)	Revise: Algorithms, Prim's Kruskal's, Dijkstra's, Floyd's (D1)
Second Order Differential Equations: Inomogeneous equations - particular integrals (CP2 Ch 7.3)	Revise: CPA, TSP (D1)
Second Order Differential Equations: Boundary conditions (CP2 Ch 7.4)	Revise: Linear Programmings (D1)

Simple harmonic motion: solve as second order DE (CP2 Ch 8.2)	First-Order Differential Equations: Separation of variables, family of solutions (CP2 Ch 7.1)
Damped SHO modelling using second order DE's including forced SHO (CP2 Ch 8.3)	First-Order Differential Equations: integrating factors, general linear (CP2 Ch 7.1)
Volumes of Revolution: both Cartesian and Parametric form (CP2 Ch 4)	First-Order Differential Equations: solving problems with 1st order Des (CP2 Ch 8.1)
Evaluate improper integrals (CP2 Ch 3)	Simultaneous differential equations: coupled first-order linear (CP2 Ch 8.4)
Mean value of functions (CP2 Ch 3)	Simultaneous differential equations: predator-prey models (CP2 Ch 8.4)
Differentiation of inverse trig functions (CP2 Ch 3)	Polar Coordinates: Using polar coordinates, converting between polar and Cartesian coordinates (CP2 Ch 5)
Integration involving inverse trig functions (CP2 Ch 3)	Polar Coordinates: Using polar coordinates, sketching polar equations of curves (CP2 Ch 5)
Integration using partial fractions: extend to quadratic denominator terms (CP2 Ch 3)	Polar Coordinates: finding parallel and perpendicular tangents (CP2 Ch 5)
	Polar Coordinates: Areas bounded by curves (CP2 Ch 5)

References in brackets are to Pearson Textbooks, Core Pure 1 (CP1), Core Pure 2 (CP2), Further Statistics (FS1) and Decision (D1)