

Procedural knowledge (exam technique, skills etc):

- a: Accuracy
- b: Problem solving
- c: Logic
- d: Communication
- e: Interpretation
- f: Appropriate use of technology
- g:
- h: Diagram use
- i: Revision techniques
- j: Numeracy
- k: Units and dimensions

Across the entire curriculum thus not referenced subsequently

Across work set in all work outside of class due to synoptic nature of work set, and in progress days/interventions

Across the entire curriculum thus not referenced subsequently

Exam technique
Other procedural knowledge

No of lessons	Disciplinary Knowledge area	Disciplinary Knowledge Content	Disciplinary knowledge, that this interweaves with	Procedural knowledge progression	RS revision knowledge topic	HW focus and actions	Assessment (topic and skills assessed)
5	Complex numbers (CP1)	Imaginary and complex numbers Multiplying complex numbers Complex conjugation Roots of quadratic equations Solving cubic and quartic equations	Y13 Vectors	b	Notes page What are the different permutations of real and complex roots for quadratic, cubic, and quartic equations?	All homeworks synoptic and diagnostic	As homework column - synoptic AP as test; flexible AP as Assignment per half term
5	Argand Diagrams	Argand diagrams Modulus and argument Modulus-argument form of complex numbers Loc in the Argand diagram Regions in the Argand diagram	Complex Numbers CP1	b,h	Notes page What are the different loci you need to find on an Argand diagram?		
2	Series (CP1)	Sums of natural numbers Sums of squares and cubes	Y13 Series	b	Notes page What is the formula to the sum of the first n natural numbers?		
6	Roots of Polynomials	Roots of a quadratic equation Roots of a cubic equation Roots of a quartic equation Expressions relating to the roots of a polynomial Linear transformations of roots	Y12 Factor Theorem	b	Notes page What are the formulae for identifying the roots of quadratics/cubics/quartics? What are the rules for reciprocals/products of powers/sum of squares/sum of cubes for the roots of polynomials? How can you transform the roots of polynomials?		
4	Volumes of revolution (CP1)	Volumes of revolution around the x-axis Volumes of revolution around the y-axis Adding and subtracting volumes Modelling with volumes of revolution	Y13 Integration	b,f,h	Notes page How do you find the volume of a curve rotated about the y-axis?		
7	Matrices	Matrix multiplication Determinants Inverting a 2 x 2 matrix Inverting a 3 x 3 matrix Solving systems of equations using matrices	Y13 Vectors Y12 Quadratics and Cubics	b,c,d,f	Notes page How do you find the inverse of a 3x3 matrix by hand? How do you find the inverse of a 3x3 matrix on a calculator? How can you use matrices to solve systems of simultaneous equations, and how could the answers be configured?		
6	Linear transformations	Linear transformations in two dimensions Reflections and rotations Enlargements and stretches Successive transformations Linear transformations in three dimensions The inverse of a linear transformation	Matrices (CP1) Y12 Functions Y12 Transformations	b,c,d,f,h	Notes page When is a transformation linear? What are the matrices that represent rotation about a 3D axis?		
3	Proof by induction	Proof by mathematical induction Proving divisibility results Proving statements involving matrices	Y13/12 Proof Series CP1 Matrices CP1	c,d	Notes page		
6	Vectors (CP1)	Equation of a line in three dimensions Equation of a plane in three dimensions Scalar product Calculating angles between lines and planes Points of intersection Finding perpendiculars	Y13 Vectors Matrices CP1	b,d,h	Notes page How do you find the angle between 2 planes? How do you find if 2 lines meet in 3D space? How do you find the shortest distance between 2 lines? How do you find the shortest distance between a point and a plane?		
8	Complex numbers (CP2)	Exponential form of complex numbers Multiplying and dividing complex numbers De Moivre's theorem Trigonometric identities Sums of series nth roots of a complex number Solving geometric problems The method of differences Higher derivatives Maclaurin series Series expansions of compound functions	Complex Numbers CP1 Argand Diagrams CP1 Y13 Trigonometry Y13 Series	b			
5	Series (CP2)	Improper integrals The mean value of a function Differentiating inverse trigonometric functions Integrating using partial fractions	Series CP1 Y13 Differentiation	b,c			
5	Methods in calculus	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	Y13 Calculus	b			
4	Volumes of revolution (CP2)	Polar coordinates and equations Sketching curves Area enclosed by a polar curve Tangents to polar curves	Y13 Calculus Y13 Parametrics	b,h			
5	Hyperbolic functions	Introduction to hyperbolic functions Inverse hyperbolic functions Identities and equations Differentiating hyperbolic functions Integrating hyperbolic functions	Y13 Trigonometry Y13 Calculus	b,c			
5	Methods in differential equations	First-order differential equations Second-order homogeneous differential equations Second-order non-homogeneous differential equations Using boundary conditions	Y13 Differential Equations Y13 Calculus	b			
5	Modelling with differential equations	Modelling with first-order differential equations Simple harmonic motion Damped and forced harmonic motion Coupled first-order simultaneous differential equations	Methods in Differential Equations CP2	b,k			
8	Vectors (FP1)	Vector product Finding areas Scalar triple product Straight lines Solving geometrical problems	Vectors CP1 Matrices CP1 Linear Transformation CP1	b,c,h			
5	Conic sections 1	Parametric equations Parabolas Rectangular hyperbolas Tangents and normals Loci	Y13 Parametrics Y13 Differentiation	b,h			
6	Conic sections 2	Ellipses Hyperbolas Eccentricity Tangents and normals to an ellipse Tangents and normals to a hyperbola Loci	Conic Sections 1 FP1	b,c,h			
3	Inequalities	Algebraic methods Using graphs to solve inequalities Modulus inequalities	Y12 Inequalities Y13 Functions	b,c,d,h			
4	t-formulae	The t-formulae Applying the t-formulae to trigonometric identities Solving trigonometric equations Modelling with trigonometry	Y13 Trigonometry	b			
4	Taylor series	Taylor series Finding limits Series expansions of differential equations	Y13 Differential Equations Methods in Differential Equations CP2	b			
4	Methods in calculus	Leibnitz's theorem and nth derivatives L'Hospital's rule The Weierstrass substitution	Y13 Calculus Hyperbolics CP2 Methods in Calculus CP2	b,c			
3	Numerical methods	Solving first-order differential equations Solving second-order differential equations Simpson's rule	Y13 Numerical Methods Y13 Integration	b			
5	Reducible differential equations	First-order differential equations Second-order differential equations Modelling with differential equations Using flow charts and understanding algorithms	Y13 Differential Equations CP2 Modelling in Differential Equations CP2	b,k			
	Algorithms	Flow charts Bubble sort Quick sort Bin-Packing algorithm Order of an algorithm		c, d, e, h			
	Graphs and networks	Modelling with graphs Graph theory Special types of graph Representing graphs and networks using matrices The planarity algorithm	Algorithms	e, h			
	Algorithms on graphs	Kruskal's algorithm Prim's algorithm Applying Prim's algorithm to a distance matrix Using Dijkstra's algorithm to find the shortest path Floyd's algorithm Eulerian graphs	Algorithms Graphs and Networks Algorithms	c, d, e, h			

Route inspection	Using the route inspection algorithm Networks with more than four odd nodes	Graphs and Networks Algorithms on Graphs	c, d, e, h
Travelling salesman problem	The classical and practical travelling salesman problems Using a minimum spanning tree method to find an upper bound Using a minimum spanning tree method to find a lower bound Using the nearest neighbour algorithm to find an upper bound	Algorithms Graphs and Networks Algorithms on Graphs	b, c, d, e, h
Linear programming	Linear programming problems Graphical methods Locating the optimal point Solutions with integer values Formulating linear programming problems	Route inspection	b, c, d, e, h, k
Simplex algorithm	The simplex method Problems requiring integer solutions Two-stage-simplex method The Big-M method Modelling a project Dummy activities Early and late event times	Linear Programming Matrices CP1	b, c, e
Critical path analysis	Critical activities The float of an activity Gantt charts Resource histograms Scheduling diagrams	Algorithms Graphs and Networks	b, c, d, e, h