Year 13 Further Mathematics – Key vocabulary list

Appendix 1: Term 1

Unit 2CP2: Series

Coefficient	Hence	Partial fractions	Verify
Degree of polynomial	Maclaurin polynomial	Prove	
Derivative	Maclaurin series	Series	
Evaluate	Method of differences	Series expansion	

Unit 2CP3: Methods in calculus

Asymptote	Implicit differentiation	Inverse trigonometric function	Standard integrals
Chain rule	Improper integral	Limit (integration)	Substitution
Complete the square	Infinite	Limit (tending)	Undefined
Convergent	Integration	Mean value of a function	$arccosx$
Differentiation	Interval (a,b), $a < x < b$	Partial fractions	$arcsinx$
Divergent	Interval (a,b], $a < x \leq b$	Range	$arctanx$
Domain	Interval [a,b], $a \leq x \leq b$	Rational function	

Unit D2-2: Allocation problems

Allocation problem	Decision variables	Least cost allocation	Optimal allocation
Binary coding	Dummy column	Maximise	Reduce the matrix
Constraints	Dummy row	Maximum profit allocation	Reduced cost matrix
Cost matrix	Hungarian algorithm	Minimise	Relative cost
Costs	Incomplete data	Objective function	$n \times n$ matrix

Unit D2-3: Flows in networks 1

Arc	Directed	Labelling procedure	Source Vertex
Backward arrows	Empty arc	Lower capacity	Spare capacity
Blocked	Feasibility condition	Max flow – min cut	Supersink
Capacitated digraph	Final flow pattern	Maximal flow	Supersource
Capacitated directed network	Flow	Maximum total flow	Total flow
Capacity	Flow- augmenting route	Minimum total flow	Upper capacity
Capacity of a cut	Flow conservation	Restricted capacity	Value of a cut
Conservation condition	Forward arrows	Saturated	Vertex
Cut	Initial flow pattern	Sink vertex	

Year 13 Further Mathematics – Key vocabulary list

Appendix 1: Term 2

Unit 2CP4: Volumes of revolution

Bounded	Function	Parameter	Solid of revolution
Chain rule	Generated	Parametric curve	Substitute
Cone	Integral	Parametric limits	Summation
Cylinder	Intersection	Radians	Verify
Definite integration	Limits	Region	Volume
Exact	Model	Rotated 2π about …	Volume of revolution

Unit 2CP5: Polar coordinates

Argand diagram	Convex curve	Parallel	Region
Cardioid	"dimple"	Parametric	Sector
Cartesian coordinates	"egg"	Perpendicular	Spiral
Cartesian equation	Half-line	Polar coordinates (r, θ)	Tangent
Circle	Initial line	Polar curve	
Concave	Intersection	Polar equation	
Convex	Loop	Pole	

Unit D2-4: Flows in networks 2

Arc	Directed	Labelling procedure	Source Vertex
Backward arrows	Empty arc	Lower capacity	Spare capacity
Blocked	Feasibility condition	Max flow – min cut	Supersink
Capacitated digraph	Final flow pattern	Maximal flow	Supersource
Capacitated directed network	Flow	Maximum total flow	Total flow
Capacity	Flow- augmenting route	Minimum total flow	Upper capacity
Capacity of a cut	Flow conservation	Restricted capacity	Value of a cut
Conservation condition	Forward arrows	Saturated	Vertex
Cut	Initial flow pattern	Sink vertex	

Unit D2-5: Dynamic programming

Action	Floor	Network form	Total weight
Bellman's principle of optimality	Initial state/source	Optimal route	Value
Ceiling	Maximin	Route	Vertex/vertices
Destination	Maximum	Stage	
Dynamic programming	Minimax	State	
Final state/sink	Minimum	Table form	

Year 13 Further Mathematics – Key vocabulary list

Appendix 1: Term 3

Unit 2CP6: Hyperbolic functions

$\operatorname{cosech} x$	$\operatorname{arcosh} x$	Hyperbola	Osborn's rule
$\cosh x$	$\operatorname{arsinh} x$	Hyperbolic function	Range
$\coth x$	$\operatorname{artanh} x$	Identity	Restricted domain
$\operatorname{sech} x$	Differential	Integral	Standard integral
$\sinh x$	Domain	Inverse hyperbolic function	Substitution
$\tanh x$	Exponential form	Logarithmic form	

Unit 2CP7: Methods in differential equations

Arbitrary constant	Differentiate	Integrate	Roots
Auxiliary equation	Discriminant	Integrating factor	Second-order
Boundary conditions	Family of solution curves	Non-homogeneous	Separate variables
Complex conjugate	First-order	Particular integral	Verify
Complimentary function	General solution	Particular solution	
Differential equation	Homogeneous	Quadratic	

Unit D2-6: Game theory

Column minimax	Expected winnings	Minimum winnings	Saddle points
Constraints	Game theory	Mixed strategies	Stable solution
Decision variables	If and only if	Optimal mixed strategy	Strategy
Dominance argument	Intersection point	Pay-off matrix	Transform
Dominate	Least worst option	Play-safe strategy	Value of the game
Equilibrium	Linear programming Two-person game	Pure strategy	Weak dominance
Expected pay-off	Minimum expected pay-off	Row maximin	Zero-sum game

Unit D2-7: Recurrence relations

Arbitrary constant	Complimentary function	Initial conditions	Recurrence relation
Auxiliary equation	Distinct real roots	Linear	Recursive form
Back substitution	Explicit form	Next term	Repeated root
Characteristic equation	First-order recurrence relation	Non-homogeneous	Second-order recurrence relations
Closed form	Function of n	Particular solution	Sequence
Coefficient	General solution	Previous term	Subscript
Complex roots	Homogeneous	Rate	Term

Year 13 Further Mathematics – Key vocabulary list

Appendix 1: Term 4

Unit 2CP8: Modelling with differential equations

Acceleration	Damped harmonic motion	Heavy damping	Particular solution
Amplitude	Dependent variable	Homogeneous	Period
Boundary conditions	Displacement	Integrate	Rate of change
Centre of oscillation	First-order differential equation	Light damping	Simple harmonic motion (SHM)
Coupled first-order linear differential equations	Forced harmonic motion	Maximum	Velocity
Coupled first-order simultaneous differential equations	Frequency	Minimum	
Critical damping	General solution	Oscillation	

Unit D2-8: Decision analysis

Box/decision node	Decision tree	Optimal strategy	Utility function
Branch	Event	Pay-off	Utils
Circle/chance node	Expected monetary value EMV	Pay-off node	
Decision	Expected utility	Relative value	
Decision analysis	Expected value	Triangle/end node	