THE HIGHFIELD SCHOOL

Curriculum Plan
Department/subject: Mathematics - Year 13 Further Autumn Term
Our Vision: **We take opportunities and aspire to excellence**
Our Intent:

- All students will experience a curriculum richness, breadth and depth
- The curriculum equips every student with the knowledge and skills for the future in our local area and beyond
- The curriculum builds on prior knowledge and creates a 'web of knowledge'
- Gaps in knowledge and skills are identified and addressed quickly

Year	Autumn 1	Autumn 2
Knowledge to be taught	Pure: Volumes of revolution – volumes of revolution around the x and y axis , parametrically defined curves, modelling. Polar coordinates – polar coordinates and equations, sketching curves, area enclosed, tangents to polar curves. Applied: Flows in Networks 1 – flows in networks, cuts and capacities, finding an initial flow, flow-augmenting routes, maximum flow, minimum cut theorem. Flows in Networks 2 – lower capacities, sources and sinks, restricted capacity nodes. Dynamic Programming – shortest and longest path problems, minimax and maximin problems, dynamic programming in table form.	Pure: Hyperbolic functions – introduction, inverse, identities and equations, differentiating, integrating. Methods in Differential Equations – first-order, second-order homogenous, second-order non-homogenous, boundary conditions Applied: Game Theory – play safe strategies, reducing pay off matrix, optimal strategies for games with no stable solution, converting games to linear programming problems. Recurrence Relations – forming recurrence relations, solving first-order recurrence relations, solving second-order recurrence relations.
Key Words	Pure: Volumes of revolution – radians, parametric, revolution. Polar coordinates – pole, initial line, Cartesian, spiral, sector, tangent, parallel, perpendicular. Applied:	Pure: Hyperbolic functions – sine, cosine, tangent domain, hyperbolic, inverse, identities, Osborns rule, integrals. Methods in Differential Equations – integrating factors, first order differential equations, second-order homogeneous, auxiliary equation, distinct, repeated, complex, complementary, particular integral, boundary.

	Flows in Networks 1 – capacity, source, sink, flow, feasibility condition, conservation condition, value, cut, capacity, initial flow, labelling procedure, flow-augmenting route, saturated. Flows in Networks 2 – capacity, source, sink, flow, feasibility condition, conservation condition, value, cut, capacity, initial flow, labelling procedure, flow-augmenting route, saturated, lower capacity, maximum, minimum, supersource, supersink, restricted. Dynamic Programming – stage, maximin, minimax, feasible, stage, state, action, destination, value	Applied: Game Theory –pay-off matrix, playing safe, safe-strategy, zero-sum, saddle point, maximin, minimax, dominance, mixed strategy, optimal, objective function, decision variable. Recurrence Relations – first-order, recursive, closed form, order, homogeneous, non-homogeneous, complementary function, particular solution, distinct real roots, repeated root, complex roots, auxiliary roots.
Links to prior knowledge	Pure: Volumes of revolution – Volumes of Revolution (Year 12 Autumn 2) Polar coordinates – Argand Diagram (Year 12 Autumn 1) Applied: Flows in Networks 1 – graphs and networks (Year 12 Autumn 1), algorithms on graphs (Year 12 Autumn 2) Flows in Networks 2 – graphs and networks (Year 12 Autumn 1), algorithms on graphs (Year 12 Autumn 2), Flows in Networks 1 (Year 13 Autumn 1) Dynamic Programming - graphs and networks (Year 12 Autumn 1), algorithms on graphs (Year 12 Autumn 2), Flows in Networks 1 (Year 13 Autumn 1), linear programming (Year 12 spring 1)	Pure: Hyperbolic functions – Exponentials and Logarithms (Year 12 Pure Summer 1) Methods in Differential Equations – Differentiation (Year 12 Pure Spring 2). Applied: Game Theory – linear programming (Year 12 spring 1) Recurrence Relations – Sequences and Series (Year 13 Pure Autumn 1).
How knowledge is assessed	Knowledge is assessed through both a formative and a summative approach. Teachers will use some of the following: ● Baseline assessments ● Quizzes ● Retrieval Starter questions ● Teacher questioning throughout the lessons	Knowledge is assessed through both a formative and a summative approach. Teachers will use some of the following: ● Baseline assessments ● Quizzes ● Retrieval Starter questions ● Teacher questioning throughout the lessons

	• Mini white boards • True or false activities • Student's discussion and presentations At the end of teaching every topic students complete a fundamentals test that is either self, peer or teacher assesses. This highlights gaps in knowledge so that these can be recapped prior to their end of topic test. Teachers mark and feedback the challenge test which is recorded on SIMs. Students are given an opportunity to re-sit their year 12 summer mock exam early in September to allow an opportunity to highlight progression.	• Mini white boards • True or false activities • Student's discussion and presentations At the end of teaching every topic students complete a fundamentals test that is either self, peer or teacher assesses. This highlights gaps in knowledge so that these can be recapped prior to their end of topic test. Teachers mark and feedback the challenge test which is recorded on SIMs. Students sit a mock exam which the teacher marks and feeds back to students
How gaps will be addressed	Staff have students mock results which gives an indication of where students currently are and identifies students who will need more support and this support is provided in the form of intervention. Staff analyse fundamentals test results and will provide in lesson intervention where necessary to develop students understanding of the key concepts. Staff highlight areas of concern and discuss focus points with students following their challenge tests. Staff provide re-tests for students that needed to do more work on a given topic.	Staff have students mock results which gives an indication of where students currently are and identifies students who will need more support and this support is provided in the form of intervention. Staff analyse fundamentals test results and will provide in lesson intervention where necessary to develop students understanding of the key concepts. Staff highlight areas of concern and discuss focus points with students following their challenge tests. Staff provide re-tests for students that needed to do more work on a given topic.
Cultural capital lessons	Problem solving will be embedded into lessons where students will learn to UNPACK problems pulling together different mathematical skills.	Problem solving will be embedded into lessons where students will learn to UNPACK problems pulling together different mathematical skills.

	Links to 'real life' maths will be made to give concept to mathematical skills. This is particularly clear in the applied mathematics involving Decision Maths where we are primarily looking at improving profit and loss, and how to move around a network in the most efficient manner.	Links to 'real life' maths will be made to give concept to mathematical skills. This is particularly clear in the applied mathematics involving Decision Maths where we are primarily looking at improving profit and loss, and how to move around a network in the most efficient manner.