Further Mathematics

Year Group 12

Half Term 1

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| Number of Hours | Topic |
| 20 | **Complex Numbers**  Basic definitions of complex numbers; Complex conjugates; Geometrical representation; Modulus & Argument; Loci in a complex plane; Modulus-argument Form; Factorising complex polynomials; Complex Solutions to Polynomials |
| 8 | **Correlation & regression:**  Pearson’s Product moment correlation Coefficient; Spearman’s Rank Correlation Coefficient; Hypothesis testing of PPPMCC & Spearman’s; Linear Regression |
| 8 | **Matrices:**  Matrix Arithmetic; Determinants and Inverses of 2x2 Matrices; Determinants and Inverses of 3x3 Matrices; |
| Reasons behind order of topic in this half term | |
| The first half term needs to be work which does not rely on A level Mathematics but can be taught with just GCSE mathematics knowledge.  Complex numbers is a topic that does not rely on any A level Mathematics and so is a good start point. It builds on the work of GCSE quadratics and solving equations.  Regression & Correlation is a topic that does not rely on any A level Mathematics and so is a good start point. It builds on the work of GCSE correlation and lines of best fit and has skills that are transferable to other subjcets such as science  Matrices numbers is a topic that does not rely on any A level Mathematics and so is a good start point.  Complex Numbers is a fundamental topic for Further Maths on which a large proportion of work is based so it is good to introduce it early so students can assess if the course is for them.  The first half term has a mixture of two of the 3 units of work (Further Pure & Statistics) so students and staff can get a view of the different areas | |

Further Mathematics

Year Group 12

Half Term 2

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| Number of Hours | Topic |
| 10 | **Permutations & Combinations**  The counting Principle; Permutations; Combinations; Arrangements; Probability |
| 10 | **More Matrices:**  Applications to simultaneous equations; Matrices and Transformations in 2D & 3D. Invariant Lines |
| 6 | **Chi-Squared Tests**  Contingency Table; Yates Correction |
| 6 | **Discrete Random Variables**  Definition of a Discrete Random Variable; Expectation & Variance; |
| Reasons behind order of topic in this half term | |
| Permutatuions & combinations is first look at a piece of work that builds on A level Maths work on Probability and GCSE probability and is needed before the work on Discrete Random variables  More matrces builds on the term 1 work and looks at applications of matrices  Chi-squared tests is another topic that does not rely on A level or GCSE but is very accessible and useful for social science and Biology A levels  Disrcrete Random Variables builds on A level Maths work on Probability and GCSE probability and Permutations and Combinations work | |

Further Mathematics

Year Group 12

Half Term 3

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| Number of Hours | Topic |
| 10 | **Induction:**  The principal of Induction; Induction & Matrices; Induction and divisibility; Induction & Inequalities |
| 10 | **Discrete Random Variables**  Uniform Distribution; Binomial Distribution; Geometric Distribution; Poisson Distribution |
| 10 | **Roots of Polynomials**  Roots for polynomials of order 2,3 & 4. Transformation of equations |
| Reasons behind order of topic in this half term | |
| This builds on A level work form Term one on Proof  Disrcrete Random Variables builds on A level Maths work on Probability and GCSE probability and Permutations and Combinations work  Roots of polynomials build on GCSE equations and A level work from Term 1 on equations and roots | |

Further Mathematics

Year Group 12

Half Term 4

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| Number of Hours | Topic |
| 10 | **Chi-Squared Tests**  Goodness of Fit Test for Discrete Distributions and Population proportions |
| 10 | **Sequences and Series**  Recurrence Relations; Properties of sequences; Fibonnaci and Lucas Numbers; Solving First Order Recurrence Relationships |
| 10 | **Number theory**  Number Bases; Divisibility Tests; The division algorithm; finite modular arithmetic; linear congruences; prime numbers; Euclid’s Lemma |
| Reasons behind order of topic in this half term | |
| Goodness of Fit tests are applied to the dditributions studied in Deiscreete Random Variables in half term 3  Sequences & Series build on GCSE and A level Maths work and introduces the Additional Further Pure unit of work for the first time.  Number Theory is a totally new topic with no links to previously studied topics | |

Further Mathematics

Year Group 12

Half Term 5

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| Number of Hours | Topic |
| 6 | **Vectors**  Vector equation of a line in 3D; Cartesian equation of a line in 3D;  Intersection of lines; Angles and scalar Product; Vector Product |
| 8 | **Groups**  Binary Operations; Definition of a group; Modular Arithmetic; Sub-groups; Lagrange’s Theorem; Cyclic Groups |
| 4 | **Vectors**  Vector Product; Properties of Vector Product; a x b = 0; Areas of Triangles and Parallelograms; |
| 6 | **Surfaces and partial differentiation**  Functions of two variables; Sketching sections and contours; First and second partial derivatives |
|  | **Revision and consolidation** |
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| Reasons behind order of topic in this half term | |
| Vectors builds on the A level Mathematics work completed and moves the students from 2D to 3D vectors. The A level work will have been studied in the previous term  Groups is almost a totally new topic with no links to previously studied topics but does use the modular arithmetic of Number Theory the previous term.  Surfaces and partial differentiation is almost a totally new topic with no links to previously studied topics but does use the idea of differentiation from A level Mathematics. | |

Further Mathematics

Year Group 12

Half Term 6

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| Number of Hours | Topic |
|  | **Revision and consolidation** |
|  | END OF YEAR 12 ASSESSMENT |
| 6 | **Continuous Random Variables**  Probability Density Function; Expectation; Variance; Median; Mode; |
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| Reasons behind order of topic in this half term | |
| Continuous random variables is new but uses some ideas for A level Maths about integration, probability and reference to, but not using, Normal Distribution | |