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 scienceMatrices 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 variablesMore matrces builds on the term 1 work and looks at applications of matricesChi-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 levelsDisrcrete 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 ProofDisrcrete Random Variables builds on A level Maths work on Probability and GCSE probability and Permutations and Combinations workRoots 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 3Sequences & 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 termGroups 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 |