Further Mathematics	Year 13

Plan Of Learning For The Year	
Half Term 1 **Core Pure Mathematics: Polar coordinates and polar equations, improper integrals, the mean value of a function, integration with inverse trigonometric functions, De Moivre's theorem, nth roots of a complex number, hyperbolic functions and calculus with hyperbolic functions.** **Further Pure Mathematics: Conic sections including ellipses and hyperbolas, eccentricity and loci. The method of differences, Maclaurin series.** **Half Term 2** **Core Pure mathematics: Methods in differential equations in the first order and second order. Modelling with differential equations.** **Further Pure Mathematics: Integration techniques for arc length and area of surface of revolution.**	**Half Term 3** **Core Pure Mathematics: Volumes of revolution including on parametrically defined curves. Modelling with volumes of revolution.** **Further Pure Mathematics: Modulus inequalities** **Half Term 4** **Further Pure Mathematics: Leibnitz's Theorem and nth derivatives, L'Hopital's Rule, The Weierstrass Substitution and Reducible differential equations, Taylor Series.**

Feedback, Retrieval & Assessment	Super curriculum opportunities / extra-curricular activities	Cultural Capital, SMSC, Careers and Futures
• **Self and peer assessment in class and independently** • **On-going formative assessment during lessons by teacher** • **Student/teacher one-to-one discussions** • **Retrieval starters or feedback every lesson** • **Dr Frost maths weekly independent work on skills and exam questions provides instant feedback to the work you do and highlights gaps to close** • **(Approximately) Termly formal assessments** • **Exit Ticket every two weeks resit opportunities provided during maths support at lunchtimes** • **Throughout, a focus on closing gaps after each assessment with the focus being on understanding the gap, rather than copying worked solutions**	• **https://plus.maths.org/content/** • **https://www.newscientist.com/** • **https://nrich.maths.org/post-16** • **http://www.undergroundmathematics.org super curriculum problems, often from entry exams from the prestigious universities Cambridge and Oxford** • **www.cambridgemaths.org** • **http://desmos.com/ online graphing software** • **http://geogebra.org online graphing software** • **www.amsp.org.uk hub for maths resources and links to future career options** • **www.Drfrostmaths.com (has resources linked to Further Maths curriculum or "just because" maths)** • **https://www.youtube.com/c/BicenMaths/videos a great resource for online lessons in case you miss any content**	• **Teamwork within the class.** • **Regular independent problem-solving opportunities** • **Understanding the real-life situations that mechanics can be used for.** • **Opportunities to discuss with teachers about careers linked to mathematics or engineering** • **Use of technology and how it is used in science and technological sectors** • **Development of strong independent learning and organisational skills, preparing you for further study at university level** • **Recommended Wider Reading:** ❖ *Alcock, How to Think About Analysis* ❖ *Penrose, The Emperor's New Mind: Concerning Computers, Minds, and the Laws of Physics* ❖ *Singh, Fermat's Last Theorem* ❖ *Dunham, Euler: the Master of Us All*

Common misconceptions	Connecting New Knowledge	Challenge for all
• When to apply particular methods and knowing key formulae that are not in the formula book • Applying differentiation techniques such as implicit differentiation to conics • Abstract reasoning with further vectors in 3-D	• Understand why the formulas are used. • Regular opportunities to use proof • Opportunities to explore theories and issues in further depth are signposted in lessons. • Developing an appreciation of how different areas of mathematics link together e.g. equations and graphs; differentiation and optimisation problems • Using technology to enhance learning	• Proof used throughout the course to underpin why particular statements or approaches are true • Knowledge Organisers and printed Lesson Notes used to give an overview of the learning that will take place and a chance to review the learning that has taken place prior to assessments • A focus on quality of presentation of solutions rather than getting the correct answer • Model solutions made available after assessments • Regular use of scaffolds and structured practice • Clearly defined success criteria and use of clear feedback model to show next steps to improve • Stretch activities built into each lesson