Department: Mathematics	Year 13

Plan Of Learning For The Year

Half Term 1

- ***Pure Mathematics:*** working with radian measure with sectors and trigonometric equations, small angle approximations; functions and graph skills, types of mapping, domain, range, composite, inverse functions and graph transformations; arithmetic and geometric sequences and series, periodic sequences, recurrence relations; working with the trigonometric functions sec x / cosec x / cot x, and inverse trig functions; working with parametric equations algebraically and graphically; trigonometric modelling, use of addition and double angle formulae

Half Term 2

- ***Pure Mathematics:*** modelling with parametric equations; solving using addition and double angle formulae to solve equations and prove identities, modelling; modelling using numerical methods; vectors in 3D; differentiation of non-polynomial type functions, including parametric differentiation; applications of differentiation to rates of change real world problems; introduction to integration of non-polynomial type functions
- ***Applied Mathematics:*** Moments

Half Term 3

- ***Pure Mathematics:*** further development of integration skills, including the Trapezium Rule.
- ***Applied Mathematics:*** Further work on moments; working with forces at an angle to the plane or on inclined planes, working with friction as a force; projectiles

Half Term 4

- ***Applied Mathematics:*** application of forces with both static and dynamic particles, including on inclined planes; further kinematic work with vectors; regression, correlation, and hypothesis testing with the Product Moment Correlation Coefficient (PMCC); conditional probability skills; introduction to and use of the Normal distribution to solve probability problems
- ***Pure Mathematics:*** integration as a limit; solving simple differential equations

Half Term 5

- ***Applied Mathematics:*** use the Normal distribution to solve further problems, including hypothesis testing
- ***Pure Mathematics:*** modelling with differential equations; proof by contradiction

Feedback, Retrieval & Assessment

- Self and peer assessment in class and independently
- On-going formative assessment during lessons by teacher
- Student/teacher one-to-one discussions
- 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
- Extended Exit Ticket every three weeks (approximately one/two per half term)
- Throughout, a **focus on closing gaps** after each assessment with the focus being on understanding the gap, rather than copying worked solutions

Super curriculum opportunities / extra-curricular activities

- 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

Cultural Capital, SMSC, Careers and Futures

- 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:
  "Alex's Adventures in Numberland" Alex Bellos [a chance to read deeper into mathematics and its applications in the real world]

Common misconceptions	Connecting New Knowledge	Challenge for all
• Working with degrees instead of radians when a question refers to radians • Integrating instead of differentiating and vice versa • Using the binomial expansion for $(a + bx)^n$ where n is fractional/negative but not taking the factor of a^n out of the brackets, instead taking the factor a out • Incorrect application of the modulus $y = f(\|x\|)$ with graph sketching • …and many others!	• 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 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