



Learning Aims and Curriculum Intent:

The aims are to enable students to:

- Understand mathematics and mathematical processes in a way that promotes confidence, fosters enjoyment, and provides a strong foundation for progress to further study
- Apply mathematics in other fields of study and be aware of the relevance of mathematics to the world of work and to situations in society in general
- Use their mathematical knowledge to make logical and reasoned decisions in solving problems both within pure mathematics and in a variety of contexts, and communicate the mathematical rationale for these decisions clearly and recognise incorrect reasoning
- Generalise mathematically, construct mathematical proofs, use skills and techniques to solve challenging problems that require them to decide on the solution strategy
- Represent situations mathematically and understand the relationship between problems in context and mathematical models that may be applied to solve them
- Draw diagrams and sketch graphs to help explore mathematical situations and interpret solutions, make deductions and inferences, and draw conclusions
- Read and comprehend articles concerning applications of mathematics and communicate their understanding

| Term | Content, Key Questions and Knowledge | Skills | Assessment |
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| Michaelmas | <p>Pure Mathematics: What are some algebraic tools to model complex systems or pattern?</p> <p>1. How to describe patterns using expressions and solve problems (e.g. taxi fare, different loan plans, supply-demand, etc.)? (Recap)</p> <ul style="list-style-type: none"> • Sequences and series <p>2. How to solve problems involving geometry and position that include circular?</p> <ul style="list-style-type: none"> • Radians • Trigonometric functions • Trigonometric identities • Parametric equations | <ul style="list-style-type: none"> - Conversion between radians and degrees - Finding arc lengths, area and perimeter of sectors, and perimeter and area of segments using angles in radian - Solving trigonometric equations in radian - Applying small angle approximations to find approximated expressions or values - Using secant, cosecant and cotangent functions to solve problems - Sketching graphs of secant, cosecant and cotangent functions - Applying trigonometric identities related to secant, cosecant and cotangent functions - Using arccosine, arcsine and arctangent functions to solve problems - Applying the angle addition formulae - Applying the double-angle formulae - Solving trigonometric equations using all identities and formulae learnt thus far - Simplifying $a \cos x \pm b \sin x$ - Proving trigonometric identities - Converting parametric equations into Cartesian equations by substitution - Converting parametric equations into Cartesian equations using trigonometric identities - Sketching graphs for parametric equations - Finding points of intersections of parametric equations - Using exponential functions to model a linear relationship between two non-linear variables - Calculate the value of PMCC of a set of bivariate data - Evaluate the value of PMCC of a set of bivariate data - Carry out hypothesis testing for correlation between two variables using the PMCC - Producing Venn diagrams - Finding probability using a Venn diagram and set notation - Check for independence between two events - Find conditional probabilities - Producing sample space diagrams - Applying probability formulae to solve problems | <p>Retrieval quizzes to build knowledge acquisition and understanding.</p> <p>Exam Practice questions</p> <p>In-class retrieval questions</p> |
| | <p>Statistics: How to determine if a set of data follow a trend as expected? How to evaluate the probability of multiple events?</p> <p>1. How to evaluate the trend of a set of data? (e.g. making distinctions between large sets of data, difference in shopping habits between people entering a grocery store or those entering a shoe store, etc.)</p> <ul style="list-style-type: none"> • Regression, correlation and hypothesis testing <p>2. How to evaluate probability of multiple events? (e.g. probability of testing positive for a disease after administering a medicine, etc.)</p> <ul style="list-style-type: none"> • Conditional probability | | |

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| | <p>Mechanics: How to solve problems related to motions?</p> <ol style="list-style-type: none"> What affects the moment of an object about a pivot? (e.g. lever system, hanging bookshelf, etc.) <ul style="list-style-type: none"> Moments How does friction affect motions? <ul style="list-style-type: none"> Forces and friction Applications of forces How do objects in a projectile behave? (e.g. at what height or velocity to drop an aid crate, the best trajectory for throwing a discus to maximise the distance travelled etc.) <ul style="list-style-type: none"> Projectiles | <ul style="list-style-type: none"> - Producing tree diagrams - Finding conditional probability using a tree diagram - Finding resultant moment about a point - Applying the moment formulae to solve equilibrium problems - Applying the moment formulae to solve tilting problems - Resolving forces - Applying the force formulae to solve problems - Applying the force formulae to solve problems involving an inclined plane - Finding the magnitude of friction between two objects - Applying the force formulae to solve problems involving friction with or without an inclined plane - Writing equation for the horizontal motion of a projectile - Writing equation for the vertical motion of a projectile - Finding the components of a velocity of a projectile - Using the projectile equations to solve problems - Combine the component equations to find an equation of the projectile motion in terms of vertical displacement, horizontal displacement, initial speed and initial angle of motion | |
| Lent | <p>Statistics: How to determine if a set of data follow a trend as expected? How can random samples of populations be used to make predictions about entire the populations?</p> <ul style="list-style-type: none"> The normal distribution <p>Mechanics: How to solve problems related to motions?</p> <ul style="list-style-type: none"> Further kinematics <p>Exam preparation and practice</p> | <ul style="list-style-type: none"> - Describing motion in vector form - Applying kinematics formulae in vector form - Solving projectile problems in vector form - Using calculus to solve problems involving variable acceleration as complex functions - Finding probabilities involving normal distributions - Finding critical regions using the inverse normal distribution - Solve problems using the standardised normal distribution - Finding the mean and standard deviation of a normal distribution using the standardised form - Using the normal distribution as an approximation for a binomial distribution - Carry out hypothesis testing using a normal distribution | <p>Retrieval quizzes to build knowledge acquisition and understanding.</p> <p>Exam Practice questions</p> <p>In-class retrieval questions</p> <p>Exam conditions questions</p> |
| Trinity | <p>Exam preparation and practice</p> | | <p>Retrieval quizzes to build knowledge acquisition and understanding.</p> <p>Exam Practice questions</p> <p>In-class retrieval questions</p> <p>Exam conditions questions</p> |

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| What consolidation looks like in this subject | Centralised interleaved homework's, regular CDA's to create a culture of regular low stakes testing to encourage spaced memory retrieval, access to sharepoint; online resources with the schemes of work and revision tasks. | |
| Examples of Homework | Exercises to complete from the textbook (Edexcel), centralised homework worksheets and exam practice questions | |
| Key terminology | Verify, Show, Solve, Explain, Evaluate, Prove, Analyses, Hence, Limits, Constraints | |
| Super-curricular enrichment and scholarly extension | <p>Read: Fermat's Last Theorem (Simon Singh), From Calculus to Chaos (David Acheson), Life's Grandeur (Stephen Jay Gould).</p> <p>Watch: https://www.numberphile.com/</p> <p>Listen: https://podcasts.ox.ac.uk/series/secrets-mathematics</p> <p>Visit: https://www.sciencemuseum.org.uk/see-and-do/mathematics-winton-gallery</p> | |
| Useful websites | <p>DrFrostMaths.com</p> <p>Physics & Maths Tutor (physicsandmathstutor.com)</p> <p>https://www.savemyexams.co.uk</p> <p>https://login.pearson.com</p> | |
| Who can I contact? | Head of Department | Aqeel Ashiq, aas@forest.org.uk |
| | Teachers | Zamir Nazir, zahnforest.org.uk |