Subject Curriculum Overview

Subject: A Level Mathematics		Year Group: 13	AUTUMN TERM
Topic	**Key Learning Points**	**Key Vocabulary**	**Assessments**
C6 – Further differentiation (continued from Year 12)	• Differentiate using the product rule • Differentiate using the quotient rule • Differentiate using the chain rule • Understand which rule/rules are required to differentiate a function • Apply differentiation rules to solve problems involving tangents, normal, stationary points and rates of change • Solve problems involving connected rates of change and inverse functions • Differentiate simple functions and relations defined implicitly • Differentiate functions defined by parametric equations and solve associated problems • Construct simple differential equations in pure mathematics and in context • Solve simple first order differential equations	Product Quotient Tangent Normal Stationary points Point of inflection Composite Implicit Explicit Parametric Differential equation General solution Particular solution	Weekly assignments used to assess understanding of current and previous knowledge Test in the week before Autumn half term holiday covering blocks C6 and C7
C7 – Further trigonometry	• Work with radian measure, including use for arc length and area of sector • Use the standard small angle approximations of sine, cosine and tangent • Know and use exact values of sin, cos and tan • Understand and use the definitions of secant, cosecant and cotangent • Draw graphs of secant, cosecant and cotangent and understand their domains and ranges • Understand and use the definitions of arcsin, arccos and arctan • Draw graphs of arcsin, arccos and arctan and understand their domains and ranges • Understand and use $\sec^2\theta \equiv 1 + \tan^2\theta$ and use $\operatorname{cosec}^2\theta \equiv 1 + \cot^2\theta$ • Understand and use compound angle formulae including proofs • Understand and use double angle including proofs • Write expressions of the form $a\cos\theta + b\sin\theta$ in the equivalent forms of $r\cos(\theta \pm \alpha)$ or $r\sin(\theta \pm \alpha)$ • Construct proofs involving trigonometric functions and inequalities • Use trigonometric functions to solve problems in context	Radian Approximation Reciprocal Secant Cosecant Cotangent Inverse Arcsin Arccos Arctan Domain Range Principal value Compound angle Double angle Harmonic form	

Subject Curriculum Overview

C8 – Sequences and series	• Extend the Binomial expansion to any rational value of n • Identify when a Binomial expansion is valid • Find sequences given by a formula for the n^{th} term and those generated by a simple relation of the form $x_{n+1} = f(x_n)$ • Understand increasing sequences; decreasing sequences; periodic sequences. • Understand and use sigma notation for sums of series • Solve problems involving arithmetic sequences and series, including the formulae for nth term and the sum to n terms • Solve problems involving geometric sequences and series including the formulae for the nth term and the sum of a finite geometric series • Find the sum to infinity of a convergent geometric series, including the use of $\|r\| < 1$; modulus notation. • Use sequences and series in modelling	Rational Series Range of validity Increasing/decreasing Periodic Oscillating Recurrence relation Converge/ diverge Limit Arithmetic Geometric Modulus notation Sigma notation	Weekly assignments used to assess understanding of current and previous knowledge Test in the week before Autumn half term holiday covering blocks C8 and C9
C9 – Integration	• Integrate e^{kx}, 1/x , sin kx, cos kx and multiples of • Use a definite integral to find the area between two curves • Understand and use integration as the limit of a sum • Find integrals using integration by substitution including with limits • Find integrals using integration by parts including with limits • Use the inverse processes of the chain and product rules respectively • Solve integration problems resulting in logs • Integrate using partial fractions that are linear in the denominator • Evaluate the analytical solution of simple first order differential equations with separable variables, including finding particular solutions • Interpret the solution of a differential equation in the context of solving a problem, including identifying limitations of the solution	Standard integrals Substitution Definite integral Rational functions Differential equation General solution Particular solution	

Subject Curriculum Overview

Subject: Mathematics		Year Group: 13	SPRING TERM
Topic	**Key Learning Points**	**Key Vocabulary**	**Assessments**
S4 – Further probability and statistical distributions	• Solve conditional probability problems involving tree diagrams, Venn diagrams, two-way tables. • Understand and use the conditional probability formula • Consider whether or not assumptions being made in order to use a given probability model are likely to be valid and the likely effect on results when more realistic assumptions are made. • Understand and use the Normal distribution as a model; find probabilities using the Normal distribution • Link to histograms, mean, standard deviation, points of inflection and the binomial distribution. • Select an appropriate probability distribution for a context, with appropriate reasoning, including recognising when the Binomial or Normal model may not be appropriate	Universal set Union Intersection Complement Conditional Mean Variance Standard deviation Normal distribution Continuous random variable Probability density function Continuity correction	Weekly assignments used to assess understanding of current and previous knowledge Statistics test on completion of blocks S4, S5 and S6
S5 – Further hypothesis testing	• Use correlation coefficients as measures of how close data points lie to a straight line and be able to interpret a given correlation coefficient using a given p-value or critical value (calculation of correlation coefficients is excluded) • Conduct a statistical hypothesis test for the mean of a Normal distribution with known, given or assumed variance and interpret the results in context	Correlation Product moment Correlation coefficient Null hypothesis Alternative hypothesis Critical value P- value Test statistic One tailed test Two tailed test	
S6 – The large data set	• Gain familiarity with data given in the large data set • Understand sources of error in the large data set and how they can be negated • Perform calculations and tests on the large data set	Outlier	

M4 – Further kinematics	• Use the constant acceleration formulae in two dimensions using vectors • Use calculus to solve problem in two dimensions with variable acceleration • Solve problems involving motion of a projectile under gravity	Projectile Time of flight Range	
M5 – Further forces	• Use vectors in three dimensions • Apply Newton's third law resolving forces in 2 dimensions: equilibrium of a particle under coplanar forces • Understand that motion may not be restricted to horizontal or vertical and that inclined planes may be used • Understand and use addition of forces; resultant forces; dynamics for motion in a plane • Understand and use the $F \leq \mu R$ model for friction; coefficient of friction; motion of a body on a rough surface; limiting friction and statics.	Magnitude Coefficient of friction Limiting equilibrium	Weekly assignments used to assess understanding of current and previous knowledge Mechanics test on completion of blocks M4, M5 and M6
M6 – Moments	• Calculate the moment of a force • Understand that the forces and moments upon a rigid body need to be balanced for it to remain in equilibrium • Understand and use moments in simple static contexts	Moment Uniform beam Centre of mass	
C10 – Numerical methods and further proof	• Locate roots of f(x) = 0 by considering changes of sign of f(x) in an interval of x on which f(x) is sufficiently well-behaved • Understand how change of sign methods can fail • Solve equations approximately using simple iterative methods • Draw associated cobweb and staircase diagrams • Solve equations using the Newton-Raphson method and other recurrence relations of the form $x_{n+1} = g(x_n)$ • Understand and use trapezium rule numerical to approximate the area under a curve Use numerical methods to solve problems in context • Proof by contradiction (including proof of the irrationality of root 2 and the infinity of primes, and application to unfamiliar proofs)	Numerical method Change of sign Continuous function Iterative formula Recurrence relation Staircase diagram Cobweb diagram Trapezium rule Contradiction Opposing statement	

Subject Curriculum Overview

Subject: Mathematics		Year Group: 13	SUMMER TERM
Topic	**Key Learning Points**	**Key Vocabulary**	**Assessments**
A-level exam preparation	• Preparation for final exams including learning of key knowledge and formulae • Revision lessons on key topics and previously identified weaknesses • Completion of practice and past papers		

Subject Curriculum Overview

How parents can support learning in the subject this academic year

Practice of mathematical skills is an essential part of students developing confidence, building fluency and improving problem-solving skills.
Students are expected to complete at least 6 hours of independent work per week:

- 4 hours of tutorial work (one hour after each lesson). Students are expected to self-mark this work and seek help when experiencing difficulties.
- 1 hour of revision work. Students will be set a revision task each week which will help them to remember key knowledge and practice previously taught skills.
- 1 hour of assessed work. Students will be given a weekly assignment focusing on the skills that they have recently been taught in lessons. This will be used to assess their understanding of a topic and may result in follow up work requiring to be completed.

Due to the hierarchical structure of Mathematics, it is vital that students catch up on any work missed through absences. Students should copy up notes and examples from lessons into their notebooks and attempt any tutorial work set. If they need support with the work then please encourage them to speak to their teacher or attend Maths Club where staff will be there to help and support.

Recommended Reading

Why do Buses Come in Threes? - Rob Eastaway/Jeremy Wyndham
How to Cut a Cake? - Ian Stewart
The Number Mysteries - (Marcus Du Sautoy
Thinking in Numbers - Daniel Tammet
Closing the Gap: The Quest to Understand Prime Numbers - Vicky Neale
50 Mathematical Ideas You Really Need to Know - Tony Crilly
The Hidden Mathematics of Sport - Rob Eastaway/John Haigh
Fermat's Last Theorem - Simon Singh
The Music of the Primes - Marcus du Sautoy

Points to note

Students are expected to bring a graphical calculator to every maths lesson. The model we currently recommend is the Casio FX CG50S. This calculator can be purchased through the school via parentpay at a significant discount to what is available commercially.