Bishop Milner CATHOLIC COLLEGE

Year 13 LONG-TERM SEQUENCE for MATHS

The curriculum for this stage of students' education has been designed to:
build directly on the core knowledge, fluency and problem solving skills developed in Year 12, while extending them into the full depth and breadth required for Edexcel A Level Mathematics across Pure Mathematics, Statistics, and Mechanics.

It ensures that students consolidate and deepen their understanding of key pure topics such as algebraic techniques, functions, calculus, vectors and proof; apply and extend their statistical foundations through hypothesis testing, probability distributions and data interpretation; and develop more sophisticated modelling and analytical skills in mechanics, including forces, motion, and moments. The programme is structured to strengthen mathematical reasoning, encourage connections across strands, and prepare students for the integrated style of assessment at A level.

Half Term 1

Students Must know:

The importance of correlation and regression, probability and the Normal Distribution, including:

- Change of variable
- Correlation coefficients
- Statistical hypothesis testing for zero correlation
- Using set notation for probability
- Conditional probability
- Questioning assumptions in probability
- Understand and use the Normal distribution
- Use the Normal distribution as an approximation to the binomial distribution
- Selecting the appropriate distribution
- Statistical hypothesis testing for the mean of the Normal distribution

The importance of Moments, Forces at any angle, Applications of kinematics and forces including:

- Forces' turning effect
- Resolving forces
- Friction forces (including coefficient of friction μ)
- Projectiles
- Equilibrium and statics of a particle (including ladder problems)
- Dynamics of a particle
- Constant acceleration (equations of motion in 2D; the i, j system)
- Variable acceleration (use of calculus and finding vectors r ˙and r ¨at a given time)

How this will be assessed:
Unit assessments

Half Term 2

Students Must know:

The importance of functions and modelling, including:

- Modulus function
- Composite and inverse functions
- Transformations
- Modelling with functions

The importance of sequences and series, including:

- Arithmetic and geometric progressions (proofs of 'sum formulae')
- Sigma notation
- Recurrence and iterations

The importance of binomial expansion , including:

- Expanding (a + bx)n for rational n; knowledge of range of validity
- Expansion of functions by first using partial fractions

How this will be assessed:
Unit assessments and mock exams

Half Term 3

Students Must know:

The importance of Trigonometry, including:

- Radians (exact values), arcs and sectors
- Small angles
- Secant, cosecant and cotangent (definitions, identities and graphs);
- Inverse trigonometrical functions; Inverse trigonometrical functions
- Compound* and double (and half) angle formulae
R cos (x ± α) or R sin (x ± α)
- Proving trigonometric identities
- Solving problems in context (e.g. mechanics)

The importance of Parametric equations, including:

- Definition and converting between parametric and Cartesian forms
- Curve sketching and modelling

How this will be assessed:
Unit assessments

Half Term 4

Students Must know:

The importance of Differentiation, including:

- Differentiating sin x and cos x from first principles
- Differentiating exponentials and logarithms
- Differentiating products, quotients, implicit and parametric functions.
- Second derivatives (rates of change of gradient, inflections)
- Rates of change problems

The importance of Numerical methods, including:

- Location of roots
- Solving by iterative methods (knowledge of 'staircase and cobweb' diagrams)
- Newton-Raphson method
- Problem solving

How this will be assessed:
Unit assessments and mock exams

Half Term 5

Students Must know:

The importance of integration, including:

- Integrating xn (including when n = –1), exponentials and trigonometric functions. Integrating functions defined parametrically.
- Using the reverse of differentiation, and using trigonometric identities to manipulate integrals
- Integration by substitution
- Integration by parts
- Use of partial fractions
- Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation).

- Areas under curves expressed parametrically
- The trapezium rule
- Differential equations (including knowledge of the family of solution curves)

How this will be assessed:
Unit assessments

Half Term 6

Students Must know:

How this will be assessed:
External exams

Embedding this knowledge can be supported at home by:
Embedding this knowledge can be supported at home by encouraging students to practise core skills regularly through short, frequent problem solving sessions, discussing their mathematical thinking out loud to strengthen oracy and reasoning, reviewing class notes and worked examples to improve mathematical reading, and completing written solutions that show clear steps and justification to develop strong mathematical writing; families can also support by helping students build good study habits, encouraging them to use online tools such as Desmos or GeoGebra for visualisation, and linking topics like integration, modelling and numerical methods to real world contexts such as finance, science, engineering or everyday problem solving.