A level Mathematics (Yr 12) Curriculum Map

Curriculum map overview:
This Curriculum Map gives an overview of A level Maths Year 1 Mathematics Curriculum at SMCS. This map outlines the key understanding, knowledge and skills to be taught during Year 1 and maps key summative assessments. Formative assessments are embedded into each section of learning.

Department Intent : To develop students' curiosity and creativity, rich in skills and knowledge, preparing students well for everyday life and future pathways.

Year 13 Ready

Year 12 Pentecost Term

Exponentials and Logarithms

- Know and use the function a^x and e^x and its graphs.
- Know that the gradient of e^{kx} is equal to ke^{kx}.
- Know and use ln x and e^x as the inverse of each other in algebraic and graphical representation.
- Understand and use the laws of logarithms.
- Solve equations of the form a^x = b.
- Understand and use exponential growth and decay; use in modelling; consideration of limitations and refinements of exponential models

Skills Focus: Understand and use the laws of logarithms

Statistics and Kinematics

- Understand and apply the language of statistical hypothesis testing, developed through a binomial model
- Conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context
- Use calculus in kinematics for motion in a straight line.

Skills Focus: Understand and apply hypothesis testing, and calculus.

Proof and Algebraic Fractions

- Understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; use methods of proof, including proof by deduction and proof by contradiction.
- Simplify rational expressions including by factorising and cancelling, and algebraic division
- Decompose rational functions into partial fractions

Skills Focus: Understand and use the structure of mathematical proof and algebra.

Pentecost Term

= Assessment

Year 12 Lent Term

Trigonometry and Vectors

- Understand and use the sine, cosine and tangent ratios, functions; their graphs, sine and cosine rules, area of triangle.
- Understand and use trigonometric identities and solve simple trigonometric equations.
- Use vectors in different formats and understand their geometrical interpretation and solve problem in context.

Skills Focus: Identify and apply trigonometric ratios and graphs. Perform algebraic operations to vectors and understand their geometrical interpretation.

Statistics and Kinematics

- Understand and use mutually exclusive and independent events when calculating probabilities
- Understand and use simple, discrete probability distributions including the binomial distribution.
- Understand and use Newton's first, second and third law

Skills Focus: Understand and use distributions, events, and Newtons laws.

Differentiation and Integration

- Differentiation from first principles for small positive integer powers of x, sketch gradient functions, and interpret as a rate of change.
- Apply differentiation to find gradients and identify increasing/decreasing functions.
- Know and use the Fundamental Theorem of Calculus, integrate x^n, and evaluate definite integrals.

Skills Focus: Use and apply calculus, interpret and solve contextual problems.

Statistics and Kinematics

- Understand and apply the language of statistical hypothesis testing.
- Conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context
- Further understand and use Newton's first, second and third law.

Skills Focus: Understand and use hypothesis testing, and Newtons laws.

Lent Term

Year 12 Advent Term

Co-ordinate Geometry

- Understand and use proportional relationships and their graphs
- Understand and use the equation of a straight line, including the forms $y-y1=m(x-x1)$y −y 1=m(x−x1) and $ax+by+c$=0ax+by +c=0
  Gradient conditions for two straight lines to be parallel or perpendicular
  Be able to use straight line models in a variety of contexts
- Understand and use the coordinate geometry of the circle including using the equation of a circle in the form $(x-a)2+(y-b)2=r^2$
- Manipulate polynomials algebraically, including factorisation and simple algebraic division; use of the factor theorem
- Understand and use the structure of mathematical proof, use methods of proof, including: proof by deduction, proof by exhaustion, disproof by counter-example
- Understand and use the binomial expansion of $(a+bx)n$, for positive integer n; the notations $n!$ and nCr; link to binomial probabilities
- Interpret diagrams for single-variable data, and connect to probability distributions
- Interpret scatter diagrams and regression lines for bivariate data.
- Interpret measures of central tendency and variation, extending to standard deviation.
- Recognise and interpret possible outliers in data sets and statistical diagrams.
  Select or critique data presentation techniques in the context of a statistical problem.
- Understand further graphical representations, derive formulae and use the language of kinematics: position; displacement; distance travelled; velocity; speed; acceleration.

Algebra and Functions

- Understand and use the laws of indices for all rational exponents, use and manipulate surds, including rationalising the denominator
- Work with quadratic functions and their graphs including the discriminant of a quadratic function, completing the square, solution of quadratic equations, including solving quadratic equations in a function of the unknown
- Solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation
- Solve linear and quadratic inequalities in a single variable and interpret such inequalities graphically, including inequalities with brackets and fractions. Express solutions through correct use of 'and' and 'or', or through set notation, represent linear and quadratic inequalities graphically.
- Manipulate polynomials algebraically, including expanding brackets, collecting like terms and factorisation and simple algebraic division; use of the factor theorem
- Understand and use graphs of functions; sketch curves defined by simple equations including polynomials, y=axy =ax and y=ax2y =ax2 (including their vertical and horizontal asymptotes)
- Interpret algebraic solution of equations graphically; use intersection points of graphs to solve equations
- Understand the effect of simple transformations on the graph of y=f(x)y =f(x) including sketching associated graphs: y=af(x)y =af(x), y=f(x)+ay =f(x)+a, y=f$(x+a)$y =f(x+a), y=f(ax)
- Use samples to make informal inferences about the population. Understand and use sampling techniques, including simple random sampling and opportunity sampling, select or critique sampling techniques in the context of solving a statistical problem, including understanding that different samples can lead to different conclusions about the population
- Interpret diagrams and measures of central tendency.
- Understand graphical representations, derive formulae and use the language of kinematics: position; displacement; distance travelled; velocity; speed; acceleration.

Statistics and Kinematics

Skills Focus:
Perform essential algebraic manipulations and sketch graphs of functions displaying key features.
Use key terms and describe advantages / disadvantages of data sets.
Calculate and interpret / draw inferences from measures of spread.

Skills Focus:
Apply the key components to give equations of lines and circles and make deductions and inferences.
Perform further essential algebraic manipulations.
Interpret diagrams and make predictions, critique data representation techniques.
Recognise and solve problems using appropriate kinematic formulae.

Advent Term

"Millions saw the apple fall, but Newton asked why." – **Bernard Baruch**