chaseterraceacademy

Year 12: Curriculum Implementation Plan

Knowledge and Skills – Students will be taught to…	Reading, Oracy, Literacy	Formative Assessment	Summative Assessment
Please see individual units below.	• Reading worded questions to understand the context and decide how to approach a problem • Paired/collaborative discussion of problems • Writing responses to worded questions such as “Explain why…” • Expanding vocabulary of key mathematical terms • Giving verbal responses in class question-and-answer	• Questioning in class • Self-assessment • Peer-assessment • Starter and homework questions • Weekly revision sheets, including practice exam questions • Regular mini-assessments • Show of hands and other forms of whole-class feedback • Review of student work during lessons • Practice exam papers and exam-style questions	Regular assessment of progress against exam-style questions, in line with the school assessment calendar

chaseterraceacademy

Mathematics – Pure Unit 1 – Algebraic Expressions	
Unit content:	By the end of the sub-unit, students should:
1.1 Index Laws 1.2 Expanding Brackets 1.3 Factorising 1.4 Negative and Fractional Indices 1.5 Surds 1.6 Rationalising denominators	• be able to perform essential algebraic manipulations, such as expanding brackets, collecting like terms, factorising etc; • understand and be able to use the laws of indices for all rational exponents; • be able to use and manipulate surds, including rationalising the denominator
Mathematics – Pure Unit 2 – Quadratics	
Unit content:	By the end of the sub-unit, students should:
2.1 Solving Quadratic Equations 2.2 Completing the Square 2.3 Functions 2.4 Quadratic Graphs 2.5 The Discriminant 2.6 Modelling with Quadratics	• be able to solve a quadratic equation by factorising; • be able to work with quadratic functions and their graphs; • know and be able to use the discriminant of a quadratic function, including the conditions for real and repeated roots; • be able to complete the square for $a \geq 1$ • be able to solve quadratic equations, including in a function of the unknown.
Mathematics – Pure Unit 3 – Equations and Inequalities	
Unit content:	By the end of the sub-unit, students should:
3.1 Linear simultaneous Equations 3.2 Quadratic Simultaneous Equations 3.3 Simultaneous Equations on a Graph 3.4 Linear inequalities 3.5 Quadratic Inequalities 3.6 Inequalities on a Graph 3.7 Regions	• be able to solve linear simultaneous equations using elimination and substitution; • be able to use substitution to solve simultaneous equations where one equation is linear and the other quadratic. • be able to solve linear and quadratic inequalities; • know how to express solutions through correct use of 'and' and 'or' or through set notation; • be able to interpret linear and quadratic inequalities graphically; • be able to represent linear and quadratic inequalities graphically.

chaseterraceacademy

Mathematics – Pure Unit 4 – Graphs and Transformations	
Unit content:	By the end of the sub-unit, students should:
4.1 Cubic Graphs 4.2 Quartic Graphs 4.3 Reciprocal Graphs 4.4 Points of Intersection 4.5 Translating Graphs 4.6 Stretching Graphs 4.7 Transforming Functions	• understand and use graphs of functions; • be able to sketch curves defined by simple equations including polynomials; • be able to use intersection points of graphs to solve equations; • understand the effect of simple transformations on the graph of y=f(x) y=f(x); • be able to sketch the result of a simple transformation given the graph of any function y=f(x) y=f(x)
Mathematics – Pure Unit 5 – Straight Line Graphs	
Unit content:	By the end of the sub-unit, students should:
5.1 y = mx + c 5.2 Equations of Straight Lines 5.3 Parallel & Perpendicular Lines 5.4 Length & Area 5.5 Modelling with Straight Lines	• understand and use the equation of a straight line; • know and be able to apply the gradient conditions for two straight lines to be parallel or perpendicular; • be able to find lengths and areas using equations of straight lines; • be able to use straight-line graphs in modelling.
Mathematics – Pure Unit 6 – Circles	
Unit content:	By the end of the sub-unit, students should:
6.1 Midpoints & Perpendicular Bisectors 6.2 Equation of a Circle 6.3 Intersection of Straight Lines & Circles 6.4 Use Tangent & Chord Properties 6.5 Circles & Tangents	• be able to find the midpoint of a line segment; • understand and use the equation of a circle; • be able to find points of intersection between a circle and a line; • know and be able to use the properties of chords and tangents.

Mathematics – Pure Unit 7 – Algebraic Methods	
Unit content:	By the end of the sub-unit, students should:
7.1 Algebraic Fractions 7.2 Dividing Polynomials 7.3 The Factor Theorem 7.4 Mathematical Proof 7.5 Methods of Proof	• be able to use algebraic division; • know and be able to apply the factor theorem; • be able to fully factorise a cubic expression; • understand and be able to use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; • be able to use methods of proof, including proof by deduction, proof by exhaustion and disproof by counter-example.
Mathematics – Pure Unit 8 – The Binomial Expansion	
Unit content:	By the end of the sub-unit, students should:
8.1 Pascal's Triangle 8.2 Factorial Notation 8.3 The Binomial Expansion 8.4 Solving Binomial Problems 8.5 Binomial Estimation	• understand and be able to use the binomial expansion of $(a + bx)^n$ for positive integer n • be able to find an unknown coefficient of a binomial expansion.
Mathematics – Pure Unit 9 – Trigonometric Ratios	
Unit content:	By the end of the sub-unit, students should:
9.1 The Cosine Rule 9.2 The Sine Rule 9.3 Areas of Triangles 9.4 Solving Triangle Problems 9.5 Graphs of Sine, Cosine & Tangent 9.6 Transforming Trigonometric Graphs	• understand and be able to use the definitions of sine, cosine and tangent for all arguments; • understand and be able to use the sine and cosine rules; • understand and be able to use the area of a triangle in the form 12 absin$C$ 12absinC ; • understand and be able to use the sine, cosine and tangent functions; their graphs, symmetries and periodicity.

Mathematics – Pure Unit 10 – Trigonometric Identities and Equations	
Unit content:	By the end of the sub-unit, students should:
10.1 Angles in All Four Quadrants 10.2 Exact Values of Trigonometrical Ratios 10.3 Trigonometric Identities 10.4 Simple Trigonometric Equations 10.5 Harder Trigonometric Equations 10.6 Equations & Identities	• be able to solve trigonometric equations within a given interval • understand and be able to use $tan\theta = \frac{sin\theta}{cos\theta}$ • Understand and use $sin^2\theta + cos^2\theta = 1$
Mathematics – Pure Unit 11 - Vectors	
Unit content:	By the end of the sub-unit, students should:
11.1 Vectors 11.2 Representing Vectors 11.3 Magnitude & Direction 11.4 Position Vectors 11.5 Solving Geometric Problems 11.6 Modelling with Vectors	• be able to use vectors in two dimensions; • be able to calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form; • be able to add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations. • understand and be able to use position vectors; • be able to calculate the distance between two points represented by position vectors; • be able to use vectors to solve problems in pure mathematics and in context, (including forces).

chaseterraceacademy

Mathematics – Pure Unit 12 - Differentiation	
Unit content:	By the end of the sub-unit, students should:
12.1 Gradients of Curves 12.2 Finding the Derivative 12.3 Differentiating x^n 12.4 Differentiating Quadratics 12.5 Differentiating Functions with Two or More Terms 12.6 Gradients, Tangents & Normals 12.7 Increasing & Decreasing Functions 12.8 Second Order Derivatives 12.9 Stationary Points 12.10 Sketching Gradient Functions 12.11 Modelling with Differentiation	• understand and be able to use the derivative of f(x) as the gradient of the tangent to the graph of y=f(x) at a general point (x,y) • understand the gradient of the tangent as a limit and its interpretation as a rate of change; • be able to sketch the gradient function for a given curve; • be able to find second derivatives; • understand differentiation from first principles for small positive integer powers of x ; • be able to differentiate x^2 , for rational values of *n*, and related constant multiples, sums and differences. • be able to apply differentiation to find gradients, tangents and normals, maxima and minima and stationary points; • be able to identify where functions are increasing or decreasing.

Mathematics – Pure Unit 13 – Integration	
Unit content:	By the end of the sub-unit, students should:
13.1 Integrating x^n 13.2 Indefinite Integrals 13.3 Finding Functions 13.4 Definite Integrals 13.5 Areas Under Curves 13.6 Areas Under the x-axis 13.7 Areas Between Curves & Lines	• know and be able to use the Fundamental Theorem of Calculus; • be able to integrate $x\ n$ xn (excluding *n* = −1), and related sums, differences and constant multiples. • be able to evaluate definite integrals; • be able to use a definite integral to find the area under a curve.

Mathematics – Pure Unit 14 – Exponentials and Curves	
Unit content:	By the end of the sub-unit, students should:
14.1 Exponential Functions 14.2 $y=e^x$ 14.3 Exponential Modelling 14.4 Logarithms 14.5 Laws of Logarithms 14.6 Solving Equations Using Logarithms 14.7 Working with Natural Logarithms 14.8 Logarithms & Non-Linear Data	• know and be able to use the function a^x and its graph, where a is positive; • know and be able to use the function e^x and its graph; • know that the gradient of e^x is equal to ke^{kx} and hence understand why the exponential model is suitable in many applications; • know and be able to use the definition of $log_a x$ as the inverse of a^x, where a is positive and $x \geq 0$; • know and be able to use the function $\ln x$ and its graph; • know and be able to use $\ln x$ as the inverse function of e^x; • understand and use the laws of logarithms: • be able to solve equations of the form $a^x = b$ • be able to use logarithmic graphs to estimate parameters in relationships of the form $y = ax^n$ and $y = kb^x$, given data for x and y; • to understand and be able to use exponential growth and decay in modelling, giving consideration to limitations and refinements of exponential models.

Mathematics – Applied Unit 1 – Data Collection	
Unit content:	By the end of the sub-unit, students should:
1.1 Populations and samples 1.2 Sampling 1.3 Non-random sampling 1.4 Types of data 1.5 The large data set	• understand and be able to use the terms 'population' and 'sample'; • know how to use samples to make informal inferences about the population; • be able to describe advantages and disadvantages of sampling compared to census. • understand and be able to use sampling techniques; • be able to describe advantages and disadvantages of sampling techniques; • be able to select or critique sampling techniques in the context of solving a statistical problem; • understand that different samples can lead to different conclusions about the population.
Mathematics – Applied Unit 2 – Measures of Location and Spread	
Unit content:	By the end of the sub-unit, students should:
2.1 Measures of central tendency 2.2 Other measures of location 2.3 Measures of spread 2.4 Variance and standard deviation 2.5 Coding	• be able to calculate measures of location, mean, median and mode; • be able to calculate measures of variation, standard deviation, variance, range and inter-percentile range; • be able to interpret and draw inferences from summary statistics
Mathematics – Applied Unit 3 – Representations of Data	
Unit content:	By the end of the sub-unit, students should:
3.1 Outliers 3.2 Box plots 3.3 Cumulative frequency 3.4 Histograms 3.5 Comparing data	• know how to interpret diagrams for single variable data; • recognise and interpret possible outliers in data sets and statistical diagrams; • be able to select or critique data presentation techniques in the context of a statistical problem; • be able to clean data, including dealing with missing data, errors and outliers.

Mathematics – Applied Unit 4 – Correlation	
Unit content:	By the end of the sub-unit, students should:
4.1 Correlation 4.2 Linear regression	• know how to interpret scatter diagrams and regression lines for bivariate data; • recognise the explanatory and response variables; • be able to make predictions using the regression line and understand its limitations; • understand informal interpretation of correlation; • understand that correlation does not imply causation.
Mathematics – Applied Unit 5 – Probability	
Unit content:	By the end of the sub-unit, students should:
5.1 Calculating probabilities 5.2 Venn diagrams 5.3 Mutually exclusive and independent events 5.4 Tree diagrams	• understand and be able to use mutually exclusive and independent events when calculating probabilities; • be able to make links to discrete and continuous distributions.
Mathematics – Applied Unit 6 – Statistical distributions	
Unit content:	By the end of the sub-unit, students should:
6.1 Probability distributions 6.2 The binomial distribution 6.3 Cumulative probabilities	• understand and be able to use simple, discrete probability distributions, including the binomial distribution; • be able to identify the discrete uniform distribution; • be able to calculate probabilities using the binomial distribution.

Mathematics – Applied Unit 7 – Hypothesis testing	
Unit content:	By the end of the sub-unit, students should:
7.1 Hypothesis testing 7.2 Finding critical values 7.3 One-tailed tests 7.4 Two-tailed tests	• understand and be able to apply the language of statistical hypothesis testing, developed through a binomial model. • be able to conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context; • understand that a sample is being used to make an inference about the population; • appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis.
Mathematics – Applied Unit 8 – Modelling in Mechanics	
Unit content:	By the end of the sub-unit, students should:
8.1 Constructing a model 8.2 Modelling assumptions 8.3 Quantities and units 8.4 Working with vectors	• understand the concept of a mathematical model, and be able to abstract from a real-world situation to a mathematical description • know the language used to describe simplifying assumptions; • understand the particle model; • be familiar with the basic terminology for mechanics; • be familiar with commonly-made assumptions when using models; • be able to analyse the model appropriately, and interpret and communicate the implications of the analysis in terms of the situation being modelled; • understand and use fundamental quantities and units in the S.I. system: length, time and mass; • Understand that units behave in the same way as algebraic quantities, e.g. meters per second is $m/s=m\times1/s=ms^{-1}$ • understand and use derived quantities and units: velocity, acceleration, force, weight; • know the difference between position, displacement and distance; • know the difference between velocity and speed, and between acceleration and magnitude of acceleration; • know the difference between mass and weight (including gravity); • understand that there are different types of forces.

Mathematics – Applied Unit 9 – Constant Acceleration	
Unit content:	By the end of the sub-unit, students should:
9.1 Displacement-time graphs 9.2 Velocity-time graphs 9.3 Constant acceleration formulae 1 9.4 Constant acceleration formulae 2 9.5 Vertical motion under gravity	• be able to draw and interpret kinematics graphs, knowing the significance (where appropriate) of their gradients and the areas underneath them. • recognise when it is appropriate to use the *suvat* formulae for constant acceleration; • be able to solve kinematics problems using constant acceleration formulae; • be able to solve problems involving vertical motion under gravity.
Mathematics – Applied Unit 10 – Forces and Motion	
Unit content:	By the end of the sub-unit, students should:
10.1 Force diagrams 10.2 Forces as vectors 10.3 Forces and acceleration 10.4 Motion in 2 dimensions 10.5 Connected particles 10.6 Pulleys	• understand the concept of a force; understand and use Newton's first law. • understand and be able to use Newton's second law for motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2D (**i**, **j**) vectors.); • understand and use Newton's third law; equilibrium of forces on a particle and motion in a straight line; application to problems involving smooth pulleys and connected particles.

Mathematics – Applied Unit 11 – Vectors	
Unit content:	By the end of the sub-unit, students should:
11.1 Functions of time 11.2 Using differentiation 11.3 Maxima and minima problems 11.4 Using integration 11.5 Constant acceleration formulae	• be able to use calculus (differentiation) in kinematics to model motion in a straight line for a particle moving with variable acceleration; • understand that gradients of the relevant graphs link to rates of change; • know how to find max and min velocities by considering zero gradients and understand how this links with the actual motion (i.e. acceleration = 0). • be able to use calculus (integration) in kinematics to model motion in a straight line for a particle moving under the action of a variable force; • understand that the area under a graph is the integral, which leads to a physical quantity; • know how to use initial conditions to calculate the constant of integration and refer back to the problem.