chaseterraceacademy

Year 13: Curriculum Implementation Plan

Mathematics – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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 – AS - 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.

Mathematics – A2 - Applied Unit 1 – Regression, Correlation and Hypothesis Testing	
Unit content:	By the end of the sub-unit, students should:
1.1 Exponential models 1.2 Measuring correlation 1.3 Hypothesis testing for zero correlation	• Understand exponential models in bivariate data • Use a change of variable to estimate coefficients in an exponential model • Understand and calculate the product moment correlation coefficient. • Carry out a hypothesis test for zero correlation.

Mathematics – A2 - Applied Unit 2 – Conditional Probability	
Unit content:	By the end of the sub-unit, students should:
2.1 Set Notation 2.2 Conditional Probability 2.3 Conditional Probabilities in Venn Diagrams 2.4 Probability formulae 2.5 Tree diagrams	• Understand set notation in probability • Understand conditional probability • Solve conditional probability problems using two-way tables and Venn diagrams • Use probability formulae to solve problems • Solve conditional probability using tree diagrams
Mathematics –A2 - Applied Unit 3 – The Normal Distribution	
Unit content:	By the end of the sub-unit, students should:
3.1 The normal distribution 3.2 Finding probabilities for normal distributions 3.3 The inverse normal distribution function 3.4 The standard normal distribution 3.5 Finding μ and σ 3.6 Approximating a binomial distribution 3.7 Hypothesis testing with the normal distribution	• Understand the normal distribution and the characteristics of a normal distribution curve • Find percentage points on a standard normal curve • Calculate values on a standard normal curve • Find unknown means and/or standard deviations for a normal distribution • Approximate a binomial distribution using a normal distribution • Select appropriate distributions and solve real-life problems in context • Carry out a hypothesis test for the mean of a normal distribution
Mathematics –A2 - Applied Unit 4 – Moments	
Unit content:	By the end of the sub-unit, students should:
4.1 Moments 4.2 Resultant moments 4.3 Equilibrium 4.4 Centres of Mass 4.5 Tiliting	• Calculate the turning effect of a force applied to a rigid body • Calculate the resultant moment of a set of forces acting on a rigid body • Solve problems including uniform rods in equilibrium • Solve problems involving non-uniform rods • Solve problems involving rods on the point of tilting

Mathematics –A2 - Applied Unit 5 – Forces and Friction	
Unit content:	By the end of the sub-unit, students should:
5.1 Resolving forces 5.2 Inclined planes 5.3 Friction	• Resolve forces into components • Use the triangle law to find a resultant force • Solve problems involving smooth or rough inclined planes • Understand friction and the coefficient of friction • Use $F \leq \mu R$
Mathematics –A2 - Applied Unit 6 – Projectiles	
Unit content:	By the end of the sub-unit, students should:
6.1 Horizontal projectiles 6.2 Horizontal and vertical components 6.3 Projectile at any angle 6.4 Projectile motion formulae	• Model motion under gravity for an object projected horizontally • Resolve velocity into components • Solve problems involving particles projected at an angle • Derive the formulae for time of flight, rang and greatest height, and the equation of the path of a projectile
Mathematics –A2 - Applied Unit 7 – Applications of forces	
Unit content:	By the end of the sub-unit, students should:
7.1 Static particles 7.2 Modelling with statics 7.3 Friction and static particles 7.4 Static rigid bodies 7.5 Dynamics and inclined planes 7.6 Connected particles	• Find an unknown for when a system is in equilibrium • Solve statics problems involving weight, tension and pulleys • Understand and solve problems involving limiting equilibrium • Solve problems involving motion on rough or smooth inclined planes • Solve problems involving connected particles that require the resolution of forces
Mathematics –A2 - Applied Unit 8 – Further kinematics	

Unit content:	By the end of the sub-unit, students should:
8.1 Vectors in kinematics 8.2 Vector methods with projectiles 8.3 Variable acceleration in one dimension 8.4 Differentiating vectors 8.5 Integrating vectors	• Work with vectors for displacement, velocity and acceleration when using the vector equations of motion • Use calculus with harder functions of time involving variable acceleration • Differentiate and integrate vectors with respect to time