

# Mathematics

## Year 12

### AS Applied Mathematics Scheme of Learning

**Subject leader: K Ellender**

Topics by term	Topic overview for 12 – AS Level maths					
	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
	<b>STATISTICS</b>  <b>Data Collection</b> 1.1 Populations and Samples 1.2 Sampling 1.3 Non-Random Sampling 1.4 Types of Data 1.5 The Large Data Set  <b>Measures of Location and Spread</b> 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	<b>Representations of Data</b> 3.1 Outliers 3.2 Box Plots 3.3 Cumulative Frequency 3.4 Histograms 3.5 Comparing Data  <b>Correlation</b> 4.1 Correlation 4.2 Linear Regression  <b>Probability</b> 5.1 Calculating Probabilities 5.2 Venn Diagrams 5.3 Mutually Exclusive and Independent Events 5.4 Tree Diagrams	<b>Statistical Distributions</b> 6.1 Probability Distributions 6.2 The Binomial Distribution 6.3 Cumulative Probabilities  <b>Hypothesis Testing</b> 7.1 Hypothesis Testing 7.2 Finding Critical Values 7.3 One-Tailed Tests 7.4 Two-Tailed Tests  <b>Statistics Revision</b>	<b>MECHANICS</b>  <b>Modelling in Mechanics</b> 8.1 Constructing a Model 8.2 Modelling Assumptions 8.3 Quantities and Units 8.4 Working with Vectors  <b>Constant Acceleration</b> 9.1 Displacement-Time Graphs 9.2 Velocity-Time Graphs 9.3 Constant Acceleration Formulae 1 9.4 Constant Acceleration Formula 2	<b>Constant Acceleration</b> 9.5 Vertical Motion Under Gravity  <b>Forces and Motion</b> 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	<b>Variable Acceleration</b> 11.1 Functions of Time 11.2 Using Differentiation 11.3 Maxima and Minima Problems 11.4 Using Integration 11.5 Constant Acceleration Formula  <b>Mechanics Revision</b>  <b>Statistics Revision</b>  <b>End of Year Exams</b>

Exam Board - Edexcel							
Spec Referen ces	Big Questions	Topic area: Main Items	Outcomes	Key Terms and Concepts Literacy Numeracy	Assessment and homework tasks	Resources	Personal Development Curriculum links (SMSC, British Values, WPD)
<b>Term 1 - STATISTICS</b>							
<b>Data Collection – Week 2-4</b>							
<b>1.1</b>	What factors must be considered to affect the validity of a data set?	<b>1.1 Populations and Samples</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understand ‘population’, ‘sample’, and ‘census’, and comment on the advantages and disadvantages of each.</li> <li>understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling, and opportunity sampling.</li> <li>define qualitative, quantitative, discrete and continuous data, and understand grouped data.</li> <li>understand the large data set and how to collect data from it, identify types of data and calculate simple statistics.</li> </ul>	<ul style="list-style-type: none"> <li>Population</li> <li>Sample</li> <li>Census</li> <li>Systematic</li> <li>Stratified</li> <li>Quote</li> <li>Quantitative</li> <li>Qualitative</li> <li>Continuous</li> <li>Discrete</li> <li>Classes</li> </ul>	<b>Unit 1 -</b> Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	The course content encourages students to apply logic, reason, construct arguments, critically analyse and communicate effectively. These skills are applied to both number based practice and to wider areas of mathematical application in context as students consider where these ideas could be used in the wider world.  <b>Ref: Office of National statistics.</b>
		<b>1.2 Sampling</b>					
		<b>1.3 Non-Random Sampling</b>					
		<b>1.4 Types of Data</b>					
		<b>1.5 The Large Data Set</b>					
<b>Measures of Location and Spread – Week 5-7</b>							
<b>2.3</b>	How can we represent the properties of a data set numerically?	<b>2.1 Measures of Central Tendency</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>calculate measures of central tendency such as the mean, median, and mode.</li> </ul>	<ul style="list-style-type: none"> <li>Mean</li> <li>Median</li> <li>Mode</li> <li>Quartile</li> <li>Percentile</li> </ul>	<b>Unit 2 -</b> Exercises from the Year 1 Statistics and Mechanics	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	Modelling relevance. Statistical interpretations. Critical thinking in contextual problems.
		<b>2.2 Other Measures of Location</b>					
		<b>2.3 Measures of Spread</b>					

		<b>2.4 Variance and Standard Deviation</b>	<ul style="list-style-type: none"> <li>calculate measures of location such as percentiles and deciles.</li> <li>calculate measures of spread such as range, interquartile range, and interpercentile range.</li> <li>calculate variance and standard deviation.</li> <li>understand and use coding.</li> </ul>	<ul style="list-style-type: none"> <li><b>Range</b></li> <li><b>Variance</b></li> <li><b>Standard Deviation</b></li> </ul>	Textbook and Practice Book by Pearsons		Construction of arguments. <b>Data ethics</b>
		<b>2.5 Coding</b>					
<b>Term 2</b>							
<b>Representations of Data – Week 1-3 (8-10)</b>							
<b>2.1</b> <b>2.4</b>	How can we represent the properties of a data set visually?	<b>3.1 Outliers</b> <b>3.2 Box Plots</b> <b>3.3 Cumulative Frequency</b> <b>3.4 Histograms</b> <b>3.5 Comparing Data</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>identify outliers in data sets.</li> <li>draw and interpret box plots.</li> <li>draw and interpret cumulative frequency diagrams.</li> <li>draw and interpret histograms.</li> <li>compare two data sets.</li> </ul>	<ul style="list-style-type: none"> <li><b>Frequency Density</b></li> <li><b>Outlier</b></li> </ul>	<b>Unit 3 -</b> Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	Modelling relevance. Statistical interpretations. Critical thinking in contextual problems. Construction of arguments. Data ethics
<b>Correlation – Week 4 (11)</b>							
<b>2.2</b>	In what ways can we use data to make predictions and associations?	<b>4.1 Correlation</b> <b>4.2 Linear Regression</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>draw and interpret scatter diagrams for bivariate data.</li> <li>interpret correlation and understand that it does not imply causation.</li> <li>interpret the coefficients of a regression line equation for bivariate data.</li> <li>understand when you can use a regression line to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li><b>Bivariate</b></li> <li><b>Correlation</b></li> <li><b>Regression Line</b></li> </ul>	<b>Unit 4 -</b> Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	Modelling relevance. Statistical interpretations. Critical thinking in contextual problems. Construction of arguments. Data ethics
<b>Probability – Week 5-7 (12-14)</b>							
<b>3.1</b> <b>3.2</b>	How can probability	<b>5.1 Calculating Probabilities</b> <b>5.2 Venn Diagrams</b>	By the end of this topic, students should be able to...	<ul style="list-style-type: none"> <li><b>Venn</b></li> </ul>	<b>Unit 5 -</b> Exercises from	<b>Mathsbox,</b>	Modelling relevance.

3.3	diagrams help us to model real-life events?	5.3 Mutually Exclusive and Independent Events	<ul style="list-style-type: none"> <li>calculate probabilities for single events.</li> <li>draw and interpret Venn diagrams.</li> <li>understand mutually exclusive and independent events, and determine whether two events are independent.</li> <li>use and understand tree diagrams.</li> </ul>	<ul style="list-style-type: none"> <li>Mutually Exclusive</li> <li>Independent</li> <li>Tree Diagram</li> </ul>	the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	Pearson Textbook and Practice Book, Maths genie.	Statistical interpretations. Critical thinking in contextual problems. Construction of arguments. Data ethics	
<b>Term 3</b>								
<b>Statistical Distributions – Week 1-3 (15-17)</b>								
4.1	How do we fully describe the probabilities of all outcomes in a sample space?	6.1 Probability Distributions	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understand and use simple discrete probability distributions including the discrete uniform distribution.</li> <li>understand the binomial distribution as a model and comment on appropriateness.</li> <li>calculate individual and cumulative probabilities for the binomial distribution.</li> </ul>	<ul style="list-style-type: none"> <li>Probability Distribution</li> <li>Binomial Distribution</li> <li>Trial</li> <li>Probability Mass Function</li> </ul>	Unit 6 - Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	Mathsbox, Pearson Textbook and Practice Book, Maths genie.	Modelling relevance. Statistical interpretations. Critical thinking in contextual problems. Construction of arguments. Data ethics	
6.2 The Binomial Distribution	6.3 Cumulative Probabilities							
<b>Hypothesis Testing – Week 4-6 (18-20)</b>								
5.1 5.2	How can we measure the accuracy of a prediction?	7.1 Hypothesis Testing	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understanding the language and concept of hypothesis testing.</li> <li>understand that a sample is used to make inference about a population.</li> <li>find critical values of a binomial distribution using tables.</li> <li>carry out one and two-tailed tests for the proportion of the binomial distribution and interpret the results.</li> </ul>	<ul style="list-style-type: none"> <li>Null Hypothesis</li> <li>Significance</li> <li>Critical Region</li> </ul>	Unit 7 - Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	Mathsbox, Pearson Textbook and Practice Book, Maths genie.	Modelling relevance. Statistical interpretations. Critical thinking in contextual problems. Construction of arguments. Data ethics	
7.2 Finding Critical Values	7.3 One Tailed Tests	7.4 Two Tailed Tests						

<b>Statistics Revision</b>								
<b>Term 4 - MECHANICS</b>								
<b>Modelling in Mechanics – Week 1-3 (21-23)</b>								
<b>6.1</b> <b>7.</b>	What kinds of notation are important for modelling physical processes?	<b>8.1 Constructing a Model</b> <b>8.2 Modelling Assumptions</b> <b>8.3 Quantities and Units</b> <b>8.4 Working with Vectors</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understand how the concept of a mathematical model applies to mechanics.</li> <li>understand and be able to apply some of the common assumptions used in mechanical models.</li> <li>know SI units for quantities and derived quantities used in mechanics.</li> <li>know the difference between scalar and vector quantities.</li> </ul>	<ul style="list-style-type: none"> <li><b>Simulate</b></li> <li><b>Model</b></li> <li><b>SI Units</b></li> <li><b>Vector</b></li> <li><b>Scalar</b></li> <li><b>Magnitude</b></li> <li><b>Displacement</b></li> </ul>	<b>Unit 8 -</b> Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.	
<b>Constant Acceleration – Week 4-6 (24-26)</b>								
<b>7.2</b> <b>7.3</b>	How can we model situations involving constant acceleration?	<b>9.1 Displacement-Time Graphs</b> <b>9.2 Velocity-Time Graphs</b> <b>9.3 Constant Acceleration Formulae 1</b> <b>9.4 Constant Acceleration Formulae 2</b>	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understand and interpret displacement-time graphs.</li> <li>understand and interpret velocity-time graphs.</li> <li>derive constant acceleration formulae and use them to solve problems, including those involving vertical motion under gravity.</li> </ul>	<ul style="list-style-type: none"> <li><b>Rate of Change</b></li> <li><b>Gradient</b></li> <li><b>Gravity</b></li> <li><b>Acceleration</b></li> <li><b>Particle</b></li> </ul>	<b>Unit 9 -</b> Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	<b>Mathsbox, Pearson Textbook and Practice Book, Maths genie.</b>	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.	
<b>Term 5</b>								
<b>Constant Accelerations – Week 1 (27)</b>								
		<b>9.5 Vertical Motion Under Gravity</b>						
<b>Forces and Motion – Week 2-6 (28-32)</b>								
<b>8.1</b> <b>8.2</b>	How should we model	<b>10.1 Force Diagrams</b> <b>10.2 Forces as Vectors</b>	By the end of this topic, students should be able to...	<ul style="list-style-type: none"> <li><b>Newtons Laws</b></li> <li><b>Resultant</b></li> </ul>	<b>Unit 10 -</b> Exercises from	<b>Mathsbox,</b>		

8.4 8.5	situations involving multiple forces?	10.3 Forces and Acceleration	<ul style="list-style-type: none"> <li>draw force diagrams and calculate resultant forces.</li> <li>understand and use Newton's first law.</li> <li>calculate resultant forces by adding vectors.</li> <li>understand and use Newton's second law, <math>F = ma</math>.</li> <li>apply Newton's second law to vector forces and acceleration.</li> <li>understand and use Newton's third law.</li> <li>solve problems involving connected particles.</li> </ul>	<ul style="list-style-type: none"> <li><math>F=ma</math></li> <li><math>W=mg</math></li> </ul>	the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	Pearson Textbook and Practice Book, Maths genie.	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
		10.4 Motion in 2 Dimensions					
		10.5 Connected Particles					
		10.6 Pulleys					
<b>Term 6</b>							
<b>Variable Acceleration – Week 1-4 (33-36)</b>							
7.5 8.3	How can our knowledge of differentiation and integration help us in modelling real-life scenarios?	11.1 Functions of Time	By the end of this topic, students should be able to... <ul style="list-style-type: none"> <li>understand that displacement, velocity, and acceleration may be given as a function of time.</li> <li>use differentiation to solve kinematics problem.</li> <li>use calculus to solve problems involving maxima and minima.</li> <li>use integration to solve kinematics problems.</li> <li>use calculus to derive constant acceleration formulae.</li> </ul>	differentiate integrate maxima minima	Unit 11 - Exercises from the Year 1 Statistics and Mechanics Textbook and Practice Book by Pearsons	Mathsbox, Pearson Textbook and Practice Book, Maths genie.	Modelling relevance. Critical thinking in contextual problems. Mathematical reasoning. Construction of arguments.
		11.2 Using Differentiation					
		11.3 Maxima and Minima Problems					
		11.4 Using Integration					
		11.5 Constant Acceleration Formula					
<b>Mechanics and Statistics End of Year Revision</b>							