

# Year 12 Maths - Pure and Statistics Teacher

Topic		Ref	Ex
<b>Algebraic Manipulation, Indices and Surds</b>	<b>Algebraic manipulation</b> <ul style="list-style-type: none"> <li>• Multiply and divide integer powers.</li> <li>• Expand single brackets and collect like terms.</li> <li>• Expand the product of two or three expressions.</li> <li>• Factorise linear, quadratic and cubic expressions.</li> </ul>	P2.1	P1A P1B P1C
	<b>Indices</b> <ul style="list-style-type: none"> <li>• Understand and be able to use the laws of indices</li> <li>• Evaluate expressions including negative, fractional and zero indices</li> <li>• Understand that fractional indices correspond to roots</li> <li>• Powers of negative bases</li> </ul>	P2.1	P1D
	<b>Surds</b> <ul style="list-style-type: none"> <li>• Be able to use and manipulate surds</li> <li>• Multiplication and division</li> <li>• Difference of squares</li> <li>• Rationalise denominators of the forms <math>a\sqrt{b}</math> and <math>(a \pm \sqrt{b})</math>.</li> </ul>	P2.2	P1E P1F
<b>Statistical Sampling</b>	<b>Sampling Terminology</b> <ul style="list-style-type: none"> <li>• Understand and be able to use the terms 'population' and 'sample'</li> <li>• Use samples to make informal inferences about the population.</li> <li>• Describe advantages and disadvantages of sampling compared to census.</li> </ul>	A1.1	A1A
	<b>Sampling Techniques</b> <ul style="list-style-type: none"> <li>• Understand and be able to use sampling techniques                             <ul style="list-style-type: none"> <li>• Simple random sampling</li> <li>• Stratified sampling</li> <li>• Systematic sampling</li> <li>• Quota sampling</li> <li>• Opportunity (or convenience) sampling</li> </ul> </li> <li>• Describe advantages/disadvantages of techniques</li> <li>• Select or critique sampling techniques in the context of solving a statistical problem;</li> <li>• Understand that different samples can lead to different conclusions about the population.</li> </ul>	A1.1	A1A
<b>Data Presentation and Interpretation</b>	<b>Measures of location and variation</b> <ul style="list-style-type: none"> <li>• Calculate measures of central tendency (location) - mean, median and mode;</li> <li>• Calculate measures of variation - standard deviation, variance, range and interpercentile range</li> <li>• Use linear interpolation to calculate percentiles from grouped data.</li> <li>• Be able to interpret and draw inferences from summary statistics.</li> </ul>	A2.3	A2A A2B A2C A2D A2E
	<b>Coding</b> <ul style="list-style-type: none"> <li>• Understand and use coding for both mean and standard deviation calculations.</li> </ul>	A2.3	A2F
<b>Assessment 1</b>			

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Topic		Ref	Ex
<b>Further Algebra</b>	<b>Algebraic Division</b> <ul style="list-style-type: none"> <li>• Cancel factors in algebraic fractions</li> <li>• Divide a polynomial by a linear expression</li> </ul>	P2.6	P7A P7B
	<b>Factor Theorem</b> <ul style="list-style-type: none"> <li>• Know and be able to apply the factor theorem</li> <li>• Use the factor theorem to fully factorise a cubic expression</li> </ul>	P2.6	P7C
	<b>Proof</b> <ul style="list-style-type: none"> <li>• Understand and be able to use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion.</li> <li>• Use the following methods of proof:                             <ul style="list-style-type: none"> <li>• Proof by deduction</li> <li>• Proof by exhaustion</li> <li>• Disproof by counter example</li> </ul> </li> </ul>	P1.1	P7D P7E
<b>Binomial Expansion</b>	<ul style="list-style-type: none"> <li>• Understand and be able to use the binomial expansion of <math>(a+bx)^n</math> for positive integer <math>n</math></li> <li>• Use Pascal's triangle or factorial notation for expansions</li> <li>• Find an individual coefficient in a binomial expansion</li> <li>• Use a binomial expansion to make approximations</li> </ul>	P4.1	P8A P8B P8C P8D
<b>Data Presentation and Interpretation</b>	<b>Single Variable Data</b> <ul style="list-style-type: none"> <li>• Interpret diagrams for single variable data:                             <ul style="list-style-type: none"> <li>• Histograms</li> <li>• Frequency polygons</li> <li>• Cumulative frequency diagrams</li> <li>• Box and Whisker plots (including outliers)</li> </ul> </li> </ul>	A2.1	A3A A3B A3C A3D
	<b>Bivariate Data</b> <ul style="list-style-type: none"> <li>• Interpret scatter diagrams and regression lines for bivariate data</li> <li>• Recognise the explanatory (independent) and response (dependent) variables</li> <li>• Be able to make predictions using the regression line and understand its limitations (danger of extrapolation)</li> <li>• Identify and interpret correlation, using terms 'positive', 'negative', 'zero', 'strong' and 'weak'.</li> <li>• Understand that correlation does not imply causation</li> </ul>	A2.2	A4A A4B
	<b>Outliers and Cleaning Data</b> <ul style="list-style-type: none"> <li>• Recognise and interpret possible outliers in data sets and statistical diagrams. (Any rule to be used will be specified in the question.)</li> <li>• Select or critique data presentation techniques in the context of a statistical problem.</li> <li>• Clean data, including dealing with missing data, errors and outliers.</li> </ul>	A2.4	A3A
<b>Assessment 2</b>			

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Topic		Ref	Ex
<b>Differentiation</b>	<b>Definition and differentiating polynomials</b> <ul style="list-style-type: none"> <li>• Understand and be able to use the derivative of <math>f(x)</math> as the gradient of the tangent to the graph of <math>y=f(x)</math> at a general point <math>(x,y)</math></li> <li>• Interpret <math>dy/dx</math> as the rate of change of <math>y</math> with respect to <math>x</math>.</li> <li>• Differentiation from first principles for small positive integer powers of <math>x</math></li> <li>• Sketch the gradient function for a given curve</li> <li>• Differentiate <math>x^n</math>, for rational values of <math>n</math>, and related constant multiples, sums and differences. Including those that require algebraic manipulation first.</li> <li>• Understand and use the second derivative as the rate of change of gradient.</li> </ul>	P7.1 P7.2	P12A P12B P12C P12D P12E
	<b>Applications of differentiation</b> <ul style="list-style-type: none"> <li>• Use the derivative to solve problems involving gradients, tangents and normal.</li> <li>• Identify increasing and decreasing functions</li> <li>• Find stationary points of functions and determine their nature.</li> </ul>	P7.3	P12F P12G P12H P12I P12J
<b>Trigonometry</b>	<b>Trigonometric Ratios and Graphs</b> <ul style="list-style-type: none"> <li>• Use the definitions of sine, cosine and tangent for all arguments</li> <li>• Sketch the graphs of the sine, cosine and tangent functions</li> <li>• Sketch simple transformations of these graphs</li> </ul>	P5.2	P9E P9F P9G
	<b>Trigonometric Identities and Equations</b> <ul style="list-style-type: none"> <li>• Know and use the relationships:  <math display="block">\tan x = \frac{\sin x}{\cos x} \text{ and } \sin^2 x + \cos^2 x = 1</math> </li> <li>• Solve trigonometric equations within a given interval including one of the form: <ul style="list-style-type: none"> <li>• <math>\sin(x + 70^\circ) = 0.5</math></li> <li>• <math>3 + 5 \cos 2x = 1</math></li> <li>• <math>6 \cos^2 x + \sin x - 5 = 0</math></li> </ul> </li> <li>• Find multiple solutions in a given range using CAST diagram or graphs</li> </ul>	P5.3 P5.4	P10A P10B P10C P10D P10E P10F
	<b>Sine rule, cosine rules and <math>\frac{1}{2} AB \sin C</math></b> <ul style="list-style-type: none"> <li>• Be able to use the sine and cosine rules to find missing sides and angles</li> <li>• Find the area of a triangle using <math>\frac{1}{2} AB \sin C</math></li> </ul>	P5.1	P9A P9B P9C P9D
<b>Assessment 3</b>			

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<b>Probability</b>	<ul style="list-style-type: none"> <li>• Identify mutually exclusive events and use the addition rule.</li> <li>• Identify independent events and use the multiplication rule.</li> <li>• Make use of Venn diagrams and tree diagrams when solving probability problems.</li> <li>• Link to discrete and continuous distributions – probability represents area under a curve for continuous distribution.</li> </ul>	A3.1	P5A P5B P5C P5D
<b>Statistical Distributions</b>	<p><b>Probability Distributions</b></p> <ul style="list-style-type: none"> <li>• Understand and be able to use simple, discrete probability distributions (NO mean or variance)</li> <li>• Know and be able to identify the discrete uniform distribution</li> <li>• Calculate probabilities using the binomial distribution</li> <li>• Use a calculator to find individual or cumulative binomial probabilities.</li> </ul>	A4.1	P6A P6B P6C
<b>Hypothesis testing (introduction)</b>	<p><b>Principles and language of hypothesis testing</b></p> <ul style="list-style-type: none"> <li>• Understand the language and concept of hypothesis testing, developed through a binomial model</li> <li>• Understand that a sample is used to make an inference about a population</li> <li>• Understand the terms:                             <ul style="list-style-type: none"> <li>• Null hypothesis <math>H_0</math></li> <li>• Alternative hypothesis <math>H_1</math></li> <li>• Critical value</li> <li>• Critical region</li> <li>• Significance level</li> <li>• one-tail test</li> <li>• two-tail test</li> <li>• Acceptance region</li> <li>• p-value</li> </ul> </li> </ul>	A5.1 A5.2	P7A P7B
<b>Hypothesis testing</b>	<p><b>Conducting hypothesis testing</b></p> <ul style="list-style-type: none"> <li>• Find critical values of a binomial distribution using tables or a calculator</li> <li>• Appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis</li> <li>• Be able to calculate the critical region and the p-value</li> <li>• Carry out a one-tailed or two-tailed test for the proportion of the binomial distribution and interpret the results in context.</li> </ul>	A5.1 A5.2	P7C P7D
<b>End of year 12 Pure and Applied Exams</b>			