

## 2.5 A2 UNIT 5

### Unit 5: Further Statistics B

Written examination: 1 hour 45 minutes

25% of A level qualification

80 marks

Candidates will choose **either** Unit 5 **or** Unit 6.

The subject content is set out on the following pages. There is no hierarchy implied by the order in which the content is presented, nor should the length of the various sections be taken to imply any view of their relative importance.

Candidates will be expected to be familiar with the knowledge, skills and understanding implicit in A Level Mathematics.

Topics	Guidance
<b>2.5.1 Samples and Populations</b>	
Understand and use unbiased estimators:	
Understand and use the variance criterion for choosing between unbiased estimators.	
Understand and use unbiased estimators of a probability and of a population mean and their standard errors.	
Understand and use an unbiased estimator of a population variance.	Use of $s^2 = \frac{1}{n-1} \sum (x_i - \bar{x})^2$ .

Topics	Guidance
<b>2.5.2 Statistical Distributions</b>	
<p>Understand and use the result that a linear combination of independent normally distributed random variables has a normal distribution.</p> <p>Understand and use the fact that the distribution of the mean of a random sample from a normal distribution with known mean and variance is also normal.</p> <p>Know and use the Central Limit Theorem: Understand and use the fact that the distribution of the mean of a large random sample from any distribution with known mean and variance is approximately normally distributed.</p>	<p>For a population with mean <math>\mu</math> and variance <math>\sigma^2</math>, for large <math>n</math></p> $\bar{X} \approx \sim N\left(\mu, \frac{\sigma^2}{n}\right)$
<b>2.5.3 Hypothesis Testing</b>	
<p>Understand and use tests for:</p> <p>(a) a specified mean of any distribution whose variance is estimated from a large sample.</p> <p>(b) difference of two means for two independent normal distributions with known variances.</p> <p>(c) a specified mean of a normal distribution with unknown variance.</p> <p>Interpret results for these tests in context.</p>	<p>Using the Central Limit Theorem.</p> <p>The specified difference may be different from zero.</p> <p>To include estimating the variance from the data and using the Student's <math>t</math>-distribution. The significance level will be given and questions involving the Student's <math>t</math>-distribution will not require the calculation of <math>p</math>-values.</p>
<p>Non-parametric tests:</p> <p>Understand and use Mann-Whitney and Wilcoxon signed-rank tests, understanding appropriate test selection and interpreting the results in context.</p>	<p>Alternative tests for when a distributional model cannot be assumed. Excludes tied ranks.</p>

Topics	Guidance
<b>2.5.4 Estimation</b>	
<p>Understand and use confidence intervals:</p> <p>Understand and use confidence limits for</p> <p>(a) the mean of a normal distribution with</p> <p style="padding-left: 40px;">(i) known variance and</p> <p style="padding-left: 40px;">(ii) unknown variance,</p> <p>(b) the difference between the means of two normal distributions whose variances are known.</p> <p>Understand and use approximate confidence limits, given large samples, for a probability or a proportion.</p> <p>Interpret results in practical contexts.</p>	<p>Candidates will be expected to be familiar with the term 'confidence interval', including its interpretation.</p> <p>Estimating the variance from the data and using the Student's <math>t</math>-distribution.</p> <p>Using a normal approximation.</p>