Paper 3: Statistics and Mechanics

All the Pure Mathematics content is assumed knowledge for Paper 3 and may be tested in parts of questions.

To support the co-teaching of this qualification with the AS Mathematics qualification, common content has been highlighted in bold.

Topics	What students need to learn:		
		Content	Guidance
2 **Data presentation and interpretation**	2.1	**Interpret diagrams for single-variable data, including understanding that area in a histogram represents frequency.** **Connect to probability distributions.**	**Students should be familiar with histograms, frequency polygons, box and whisker plots (including outliers) and cumulative frequency diagrams.**

Topics		What students need to learn:	
		Content	**Guidance**
2 **Data presentation and interpretation** *continued*	2.2	**Interpret scatter diagrams and regression lines for bivariate data, including recognition of scatter diagrams which include distinct sections of the population (calculations involving regression lines are excluded).**	**Students should be familiar with the terms explanatory (independent) and response (dependent) variables.** Use to make predictions within the range of values of the explanatory variable and the dangers of extrapolation. Derivations will not be required. Variables other than x and y may be used. **Use of interpolation and the dangers of extrapolation. Variables other than x and y may be used.** Change of variable may be required, e.g. using knowledge of logarithms to reduce a relationship of the form $y = ax^n$ or $y = kb^x$ into linear form to estimate a and n or k and b.
		Understand informal interpretation of correlation. **Understand that correlation does not imply causation.**	**Use of terms such as positive, negative, zero, strong and weak are expected.**
	2.3	**Interpret measures of central tendency and variation, extending to standard deviation.**	**Data may be discrete, continuous, grouped or ungrouped. Understanding and use of coding.** **Measures of central tendency: mean, median, mode.** **Measures of variation: variance, standard deviation, range and interpercentile ranges.** **Use of linear interpolation to calculate percentiles from grouped data is expected.**
		Be able to calculate standard deviation, including from summary statistics.	**Students should be able to use the statistic x** $$S_{xx} = \sum(x - \overline{x})^2 = \sum x^2 - \frac{(\sum x)^2}{n}$$ **Use of standard deviation $= \sqrt{\dfrac{S_{xx}}{n}}$ (or equivalent) is expected but the use of $S = \sqrt{\dfrac{S_{xx}}{n-1}}$ (as used on spreadsheets) will be accepted.**

Topics	What students need to learn:		
		Content	Guidance
2 **Data presentation and interpretation** *continued*	2.4	**Recognise and interpret possible outliers in data sets and statistical diagrams.**	**Any rule needed to identify outliers will be specified in the question.** **For example, use of $Q_1 - 1.5 \times \text{IQR}$ and $Q_3 + 1.5 \times \text{IQR}$ or mean $\pm 3 \times$ standard deviation.**
		Select or critique data presentation techniques in the context of a statistical problem.	**Students will be expected to draw simple inferences and give interpretations to measures of central tendency and variation.** Significance tests, other than those mentioned in Section 5, will not be expected.
		Be able to clean data, including dealing with missing data, errors and outliers.	**For example, students may be asked to identify possible outliers on a box plot or scatter diagram.**