Mathematics	Y10 Higher	Chapter 14 (S1, S3, S4, S5)	**The Bigger Picture: Statistics**	**Lessons 20**

Essential Knowledge	**Teaching Points**
• Specify the problem and plan: • decide what data to collect and what analysis is needed; • understand primary and secondary data sources; • consider fairness; • Understand what is meant by a sample and a population; • Understand how different sample sizes may affect the reliability of conclusions drawn; • Identify possible sources of bias and plan to minimise it; • Write questions to eliminate bias, and understand how the timing and location of a survey can ensure a sample is representative • Use statistics found in all graphs/charts in this unit to describe a population; • Know the appropriate uses of cumulative frequency diagrams; • Construct and interpret cumulative frequency tables; • Construct and interpret cumulative frequency graphs/diagrams and from the graph: • estimate frequency greater/less than a given value; • find the median and quartile values and interquartile range; • Compare the mean and range of two distributions, or median and interquartile range, as appropriate; • Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions; • Produce box plots from raw data and when given quartiles, median and identify any outliers; • Know the appropriate uses of histograms; • Construct and interpret histograms from class intervals with unequal width; • Use and understand frequency density; • From histograms: • complete a grouped frequency table; • understand and define frequency density; • Estimate the mean from a histogram; • Estimate the median from a histogram with unequal class widths or any other information from a histogram, such as the number of people in a given interval.	• Students need to explain why a sample may not be representative of a whole population. • Carry out their own statistical investigation and justify how sources of bias have been eliminated. • Emphasise the difference between primary and secondary sources and remind students about the difference between discrete and continuous data. • Discuss sample size and mention that a census is the whole population (the UK census takes place every 10 years in a year ending with a 1 – the next one is due in 2031, some students may have filled it in in 2021). • Specifying the problem and planning for data collection is not included in the programme of study, but is a prerequisite to understanding the context of the topic. • Writing a questionnaire is also not included in the programme of study, but remains a good topic for demonstrating bias and ways to reduce bias in terms of timing, location and question types. • Ensure that axes are clearly labelled as this can be downfall of a number of students. Books should be looked at closely during this topic to ensure compliance. • As a way to introduce measures of spread, it may be useful to find mode, median, range and interquartile range from stem and leaf diagrams (including back-to-back) to compare two data sets. • As an extension, use the formula for identifying an outlier, (i.e. if data point is below LQ – 1.5 × IQR or above UQ + 1.5 × IQR, it is an outlier). Get them to identify outliers in the data, and give bounds for data.

Assumed Prior Knowledge/ Links / Interleaving	
• Students should understand the different types of data: discrete/continuous. • Students should have experience of inequality notation. • Students should be able to multiply a fraction by a number. • Students should understand the data handling cycle.	
Potential Barriers to Access /Misconceptions	**Opportunities for Reasoning/Problem Solving/Proofs**
• Labelling axes incorrectly in terms of the scales, and also using 'Frequency' instead of 'Frequency Density' or 'Cumulative Frequency'. • Students often confuse the methods involved with cumulative frequency, estimating the mean and histograms when dealing with data tables.	• When using a sample of a population to solve contextual problem, students should be able to justify why the sample may not be representative the whole population. • Interpret two or more data sets from box plots and relate the key measures in the context of the data. • Given the size of a sample and its box plot calculate the proportion above/below a specified value.
Key Mathematical Vocabulary	Sample, population, fraction, decimal, percentage, bias, stratified sample, random, cumulative frequency, box plot, histogram, frequency density, frequency, mean, median, mode, range, lower quartile, upper quartile, interquartile range, spread, comparison, outlier