

## Mapping to Edexcel 2009 Statistics specification

Higher tier objectives appear in bold text.

Whole lessons or sections of lessons are given to match each objective as appropriate.

The collection of data	Lessons
<b>a) Planning</b>	
specify a line of enquiry to be investigated; breaking it down into more manageable parts and sub-questions when necessary	Types of data – Planning a statistical enquiry
specify a hypothesis to be tested	Types of data – Planning a statistical enquiry
determine the data required for a line of enquiry, selecting an appropriate method of obtaining the data <b>and justifying the choice of method by comparing it with possible alternatives</b>	Types of data – Planning a statistical enquiry
<b>b) Types of data</b>	
recognise that data can be obtained from primary or secondary sources	Types of data – Secondary data
recognise the difference between quantitative and qualitative variables	Types of data – Types of data
recognise the difference between discrete and continuous data	Types of data – Types of data
recognise, understand and use scales of measurement – categorical, rank	Types of data – Scales of measurement
categorise data through the use of well-defined, precise definitions, intervals or class boundaries	Types of data – Scales of measurement
<b>appreciate the implications of grouping for loss of accuracy in both calculations and presentations</b>	Calculating the mean – Grouped frequency and the mean
understand the meaning of bivariate data which may be discrete, continuous, grouped or ungrouped	Types of data – Types of data
understand, use and define situations for grouped and ungrouped data	Continuous data and frequency polygons – Grouping continuous data

c) Population and sampling	
<p>understand the meaning of the term population</p> <p>understand the word census, especially with regard to well defined, small scale and large populations, eg National census</p> <p>understand the reasons for sampling and that sample data is used to estimate values in the population</p> <p>understand the terms random, randomness and random sample</p> <p>understand the use of random numbers</p> <p>understand, design and use a sampling frame</p> <p>be able to select a simple random sample or a stratified sample by <b>more than</b> one category as a method of investigating a population <b>understand and use systematic, quota and cluster sampling</b></p> <p>have a basic idea of the concept of bias, how it might occur in a sampling procedure and how it might be minimised</p> <p><b>understand the strengths and weaknesses of various sampling methods, including bias, influences and convenience</b></p>	<p>Types of data – Planning a statistical enquiry</p> <p>Types of data – Planning a statistical enquiry Types of data – Secondary data</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Methods of sampling</p>
d) Collecting data	
<p>collect or obtain data by observation, surveys, experiments (including controlled experiments), counting, data logging, <b>convenience sampling</b>, questionnaires and measurement</p> <p>obtain primary data by questionnaires, experiments <b>or simulations</b></p> <p>understand the effects of accuracy on measurements</p> <p>understand the advantages and disadvantages of using interviews versus questionnaires</p> <p>design and use efficient and effective data capture sheets and methods of recording data</p> <p>understand the role, and use, of pilot studies and pre-testing</p>	<p>Population and sampling – Questionnaires</p> <p>Population and sampling – Questionnaires</p> <p>Population and sampling – Experimental data</p> <p>Population and sampling – Questionnaires</p> <p>Population and sampling – Methods of sampling</p> <p>Population and sampling – Questionnaires</p>

<p>understand and account for the problems of design, ambiguity of wording, leading and biased questions, definitions and obtaining truthful responses <b>with simplest form of random response in sensitive cases</b></p> <p>understand the advantages and disadvantages of open and closed questions</p> <p>be aware of, and understand, the problems related to identifying the appropriate population, the distribution and collection of questionnaires and surveys, errors in recorded answers, non-responses and missing data</p> <p>identify appropriate sources of secondary data</p> <p>extract data from secondary sources, including those based on ICT</p> <p>understand the aspects of accuracy, reliability, relevance and bias as related to secondary data</p> <p>design simple statistical experiments to obtain data</p> <p>understand the meaning of explanatory and response variables</p> <p>understand the need for identification of the variables to be investigated</p> <p>understand surveys; <b>the appropriateness of the conditions</b></p>	<p>Population and sampling – Sensitive questions</p> <p>Population and sampling – Questionnaires</p> <p>Population and sampling – Questionnaires</p> <p>Types of data – Secondary data</p> <p>Types of data – Secondary data</p> <p>Types of data – Secondary data</p> <p>Types of data – Planning a statistical enquiry</p> <p>Types of data – Planning a statistical enquiry</p> <p>Types of data – Planning a statistical enquiry</p> <p>Population and sampling – Questionnaires</p>
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Processing, representing and analysing data	Lessons
<b>a) Tabulation</b>	
construct frequency tables by tallying raw data where appropriate	Continuous data and frequency polygons – Raw data and frequency tables
tabulate using class intervals as appropriate, <b>including open-ended classes and classes of varying width</b>	Continuous data and frequency polygons – Grouping continuous data
tabulate using various forms of grouping the data	Continuous data and frequency polygons – Grouping continuous data
combine categories to simplify tables with an	Continuous data and frequency polygons –

<p>understanding of the problems of over simplification, the effects on readability, the identification or masking of trends and the loss of detail</p> <p><b>problems associated with under and over simplification through inappropriate number of significant figures or an unsuitable group size</b></p> <p>read and interpret data presented in tabular or graphical form</p> <p>design suitable tables, including summary tables; design and use appropriate two-way tables</p> <p>convert raw data to summary statistics, design, construct and present summary tables</p>	<p>Grouping continuous data</p> <p>Continuous data and frequency polygons – Grouping continuous data</p> <p>Cumulative frequency – Cumulative frequency graphs</p> <p>Continuous data and frequency polygons – Raw data and frequency tables</p> <p>Continuous data and frequency polygons – Raw data and frequency tables</p>
<p><b>b) Diagrams and representations</b></p>	<p><i>Throughout</i></p>
<p>correct and precise labelling of all forms of diagrams</p> <p>pictograms, bar charts, multiple or composite bar charts and pie charts for qualitative, quantitative and discrete data <b>and comparative pie charts with area proportional to frequency</b></p> <p>vertical line (stick) graphs for discrete data <b>and cumulative frequency step polygons</b></p> <p>for continuous data: pie charts, histograms with equal class intervals, frequency diagrams, cumulative frequency diagrams, population pyramids, <b>histograms with unequal class intervals and the concept of frequency density</b></p> <p>stem and leaf diagrams for discrete and continuous data</p> <p>scatter diagrams for bivariate data</p> <p>line graphs and time series</p> <p>choropleth maps (shading)</p> <p>simple properties of the shape of distributions of data including symmetry, positive and negative skew the distinction between well-presented and poorly presented data</p>	<p>Presenting discrete data Bar charts and histograms</p> <p>Cumulative frequency – Cumulative frequency step polygons</p> <p>Bar charts and histograms – Histograms</p> <p>Presenting discrete data – Stem and leaf diagrams</p> <p>Scatter graphs</p> <p>Time series and quality assurance</p> <p>Presenting continuous data – Choropleth maps</p> <p>Skewness and standardized scores – Skewness</p>

<p>the shape and simple properties of frequency distributions</p> <p>that many populations can be modelled by the Normal distribution</p> <p>the potential for visual misuse, by omission or misrepresentation</p> <p>the transformation from one presentation to another</p> <p>how to discover errors in data and recognise data that does not fit a general trend or pattern, <b>including outliers</b></p>	<p>Skewness and standardized scores – Skewness</p> <p>Probability distributions – The normal distribution</p> <p>Presenting continuous data – Misleading charts</p> <p>Presenting discrete data Presenting continuous data</p> <p>Range and quartiles – Outliers</p>
<b>c) Measures of central tendency</b>	
<p>work out and use the mean, mode and median of raw data presented as a list</p> <p>work out the mean, mode and median for discrete data presented as a frequency distribution</p> <p>identify the modal class interval for grouped frequency distributions for discrete or continuous data</p> <p>estimates for the mean and median of grouped frequency distributions for discrete or continuous data</p> <p><b>understand the effects of transformations of the data on the mean, mode and median</b></p> <p><b>understand the effect on the mean, mode and median of changes in the data including the addition or withdrawal of a population or sample member</b></p> <p>understand the appropriateness, advantages and disadvantages of each of the three measures of central tendency</p> <p>be able to make a reasoned choice of a measure of central tendency appropriate to a particular line of enquiry, <b>nature of the data and purpose of the analysis</b></p> <p><b>calculate and use a weighted mean</b></p>	<p>Averages</p> <p>Averages</p> <p>Averages – The mode</p> <p>Calculating the mean – Grouped frequency and the mean</p> <p>Calculating the mean – Linear transformations and the mean</p> <p>Calculating the mean – Linear transformations and the mean</p> <p>Averages – Which average?</p> <p>Averages – Which average?</p> <p>Index numbers and geometric mean – Weighted mean</p>

d) Measures of dispersion	
<p>work out and use the range for data presented in a list or frequency distribution</p> <p>work out the quartiles, percentiles and interquartile range for discrete and continuous data presented either as a list, frequency table or grouped frequency table</p> <p><b>work out interpercentile ranges for discrete and continuous data presented as a list, frequency distribution or grouped frequency distribution</b></p> <p>construct, interpret and use box plots</p> <p><b>formally identify outliers</b></p> <p><b>calculate and use variance and standard deviation</b></p> <p>understand the advantages and disadvantages of each of the measures of dispersion range, quartiles, interquartile range, percentiles, <b>deciles, interpercentile range, variance and standard deviation</b></p> <p>use an appropriate measure of central tendency together with range, quartiles, interquartile range, percentiles, <b>deciles, interpercentile range, variance and standard deviation</b> to compare distributions of data</p> <p><b>calculate, interpret and use standardised scores to compare values from different frequency distributions</b></p>	<p>Range and quartiles – Range</p> <p>Range and quartiles – Interquartile range</p> <p>Cumulative frequency – Cumulative frequency step polygons</p> <p>Presenting discrete data – Box plots</p> <p>Range and quartiles – Outliers</p> <p>Standard deviation – Standard deviation</p> <p>Standard deviation – Choosing the best measure</p> <p>Cumulative frequency – Cumulative frequency step polygons</p> <p>Standard deviation – Choosing the best measure</p> <p>Cumulative frequency – Cumulative frequency step polygons</p> <p>Skewness and standardized scores – Standardized scores</p>
e) Further summary statistics	
<p>simple index numbers</p> <p><b>chain base index numbers</b></p> <p><b>weighted index numbers</b></p> <p><b>Retail Price Index (RPI)</b></p>	<p>Index numbers and geometric mean – Simple index numbers</p> <p>Index numbers and geometric mean – Geometric mean</p> <p>Index numbers and geometric mean – Weighted mean</p> <p>Index numbers and geometric mean – Measures of expenditure and sales</p>

<b>f) Scatter diagrams and correlation</b>	
<p>plot data as points on a scatter diagram</p> <p>recognise positive, negative and zero correlation by inspection</p> <p>understand the distinction between correlation, causality and a non-linear relationship</p> <p>draw a line of best fit passing through <math>(x, y)</math> to the points on a scatter diagram</p> <p><b>find the equation of a line of best fit in the form <math>y = ax + b</math> and a practical interpretation of <math>a</math> and <math>b</math> in context</b></p> <p><b>fit non-linear models of the forms <math>y = ax^n + b</math> and <math>y = ka^x</math></b></p> <p>understand the pitfalls of interpolation and extrapolation</p> <p>interpret data presented in the form of a scatter diagram</p> <p><b>calculate, in appropriate cases, Spearman's rank correlation coefficient and use it as a measure of agreement or for comparisons of the degree of correlation</b></p>	<p>Scatter graphs – Scatter graphs</p> <p>Scatter graphs – Scatter graphs</p> <p>Correlation – Non-linear relationships</p> <p>Scatter graphs – Lines of best fit</p> <p>Scatter graphs – Lines of best fit</p> <p>Correlation – Non-linear relationships</p> <p>Scatter graphs – Lines of best fit</p> <p>Scatter graphs</p> <p>Correlation – Measuring correlation</p>
<b>g) Time series</b>	
<p>plot points as a time series; draw a trend line by eye and use it to make a prediction</p> <p>calculate and use appropriate moving averages</p> <p>identify and discuss the significance of seasonal variation by inspection of time series graphs</p> <p><b>draw a trend line based on moving averages; recognise seasonal effect at a given data point and average seasonal effect.</b></p>	<p>Time series and quality assurance – Time series graphs</p> <p>Time series and quality assurance – Time series graphs</p> <p>Time series and quality assurance – Seasonal effects</p> <p>Time series and quality assurance – Seasonal effects</p>
<b>h) Quality assurance</b>	
<p><b>plot sample means, medians and ranges over time on quality control charts that have target values, and action and warning limits</b></p>	<p>Time series and quality assurance – Quality assurance</p>

<p><b>understand that in a process under control almost all of the means, medians or ranges fall inside the action limits, and only 1 in 20 fall outside the warning limits</b></p> <p><b>know the action to be taken if a sample mean, median or range falls outside of each type of limit</b></p>	<p>Time series and quality assurance – Time series graphs</p> <p>Time series and quality assurance – Time series graphs</p>
<b>i) Estimation</b>	
<p>estimate population means from samples</p> <p>estimate population proportions from samples with applications in opinion polls and elsewhere</p> <p><b>estimate population size based on the Petersen capture/recapture method</b></p> <p>understand the effect of sample size on estimates and the variability of estimates, <b>with a simple quantitative appreciation of appropriate sample size</b></p>	<p>Population and sampling – Capture/recapture method</p> <p>Population and sampling – Capture/recapture method</p> <p>Population and sampling – Capture/recapture method</p> <p>Population and sampling – Capture/recapture method</p>

<b>Reasoning, discussing and interpreting results</b>	<b>Lessons</b>
<p>apply statistical reasoning, explain and justify inferences, deductions, arguments, solutions and decisions</p> <p>explore connections and look for and examine relationships between variables, <b>including fitting the equation to a line of best fit or trend line</b></p> <p>consider the limitations of any assumptions</p> <p><b>formally identify outliers using quartiles</b></p> <p>relate summarised data to any initial questions or observations</p> <p>interpret all forms of statistical tables, diagrams and graphs</p> <p>compare distributions of data and make comparisons using measures of central tendency and measures of dispersion, such as percentiles, <b>deciles, interpercentile range, mean deviation, variance and standard deviation</b></p>	<p style="text-align: center;"><i>Throughout</i></p> <p style="text-align: center;">Scatter graphs – Lines of best fit</p> <p style="text-align: center;"><i>Throughout</i></p> <p style="text-align: center;">Range and quartiles – Outliers</p> <p style="text-align: center;">Averages – Which average?</p> <p style="text-align: center;"><i>Throughout</i></p> <p style="text-align: center;">Averages – Which average?</p> <p style="text-align: center;">Standard deviation – Choosing the best measure</p>

<p>check results for reasonableness and modify their approaches if necessary</p> <p>interpret correlation as a measure of the strength of the association between two variables, <b>including Spearman's rank correlation coefficient for ranked data</b></p> <p><b>make predictions</b></p> <p><b>compare or choose by eye between a line of best fit and a model based on <math>y = ax^n + b</math> for <math>n = 2, 1</math> or <math>\frac{1}{2}</math>, <math>y = ax^2 + bx</math> or <math>y = ka^x</math></b></p>	<p style="text-align: center;"><i>Throughout</i></p> <p>Correlation – Measuring correlation</p> <p>Correlation – Measuring correlation</p> <p>Correlation – Non-linear relationships</p>
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<b>Probability</b>	<b>Lessons</b>
<p>understand the meaning of the words event and outcome</p>	<p>Simple probability and independent events – Introduction to probability</p>
<p>understand words such as: impossible, certain, highly likely, likely, unlikely, possible, evens and present them on a likelihood scale</p>	<p>Simple probability and independent events – Introduction to probability</p>
<p>put outcomes in order in terms of probability</p>	<p>Simple probability and independent events – Introduction to probability</p>
<p>put probabilities in order on a probability scale</p>	<p>Simple probability and independent events – Introduction to probability</p>
<p>understand the terms random and equally likely understand and use measures of probability from a theoretical perspective and from a limiting frequency or experimental approach</p>	<p>Simple probability and independent events – Single events</p>
<p>understand that in some cases the measure of probability based on limiting frequency is the only viable measure</p>	<p>Diagrams, dependent events and experimental probability – Probability from experiments</p>
<p><b>use simple cases of the binomial and discrete uniform distribution</b></p>	<p>Probability distributions</p>
<p><b>use simulation to estimate more complex probabilities</b></p>	<p>Diagrams, dependent events and experimental probability – Simulation</p>
<p>use probability to assess risk</p>	<p>Diagrams, dependent events and experimental probability – Probability from experiments</p>
<p>produce, understand and use a sample space</p>	<p>Simple probability and independent events – Combined events</p>
<p><b>understand and use Venn diagrams and Cartesian grids</b></p>	<p>Diagrams, dependent events and experimental probability – Probabilities from</p>

<p>understand the terms mutually exclusive and exhaustive and to understand the addition law <math>P(A \text{ or } B) = P(A) + P(B)</math> for two mutually exclusive events</p> <p>know, for mutually exclusive outcomes, that the sum of the probabilities is 1 and in particular the probability of something not happening is 1 minus the probability of it happening</p> <p>draw and use tree diagrams and probability tree diagrams for independent events <b>and conditional cases</b></p> <p>understand, use and apply the addition for mutually exclusive events, <b>general addition</b> and multiplication laws for independent events <b>and conditional events and outcomes</b></p> <p><math>P(A \text{ and } B) = P(A) \times P(B)</math>,  <math>P(A \text{ or } B) = P(A) + P(B)</math>,  <b><math>P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)</math>,</b>  <b><math>P(A \cap B) = P(B   A) \times P(A)</math>.</b></p> <p><b>the shape and simple properties of the Normal distribution</b></p>	<p>tables and Venn diagrams  Simple probability and independent events – Combined events</p> <p>Simple probability and independent events – Single events</p> <p>Diagrams, dependent events and experimental probability – Dependent events  Simple probability and independent events – Tree diagrams for independent events</p> <p>Simple probability and independent events  Diagrams, dependent events and experimental probability</p> <p>Simple probability and independent events  Diagrams, dependent events and experimental probability</p> <p>Probability distributions – The normal distribution</p>
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