

Data Analysis Work Scheme (Pilot 2008-9)

Before starting this Advanced (Level 3) FSMQ students should have acquired the skills and knowledge associated with the Statistics assessment objective of GCSE Mathematics or with an Intermediate (Level 2) FSMQ in Data, or equivalent. A suggested work scheme showing topic areas and methods to be covered is given below. This recommends a total of 60 guided learning hours that could be timetabled in a variety of ways eg 2 hours per week for 30 weeks, 4 hours per week for 15 weeks, 5 hours per week for 12 weeks. The order and time allocations can be varied to suit different groups of students.

Topic Area	Content	Nuffield Resource
Carrying out investigations (4 hours)	Identify characteristics that are pertinent to investigations. Introduce and use statistical terms - qualitative and quantitative data, primary and secondary data, discrete and continuous variables, population, representative, biased, random and stratified samples etc. Discuss different methods of collecting data – the use of surveys (including questionnaires), observations and experiments. Include ideas associated with consistency, repeatability and variability between samples. (N.B. The FSMQ Data Analysis concentrates on the analysis of data which has already been obtained, rather than data that students collect themselves. Therefore time should not be spent on collecting data, but students should be aware of issues relating to the collection and use of data in real situations.)	Results (starter) Data sheets containing A level results and a worksheet with related statements. Students consider the limitations of the data in assessing the truth of the statements. Optional use of spreadsheet.
		HE Applications (starter) Data Sheets, spreadsheet & worksheet using gender, age, ethnic origin and other information about HE applicants.
		Football Figures (skills activity) Excel spreadsheet containing 2007-8 data for each premier league club. Teacher Notes suggest uses.
		Sampling (starter) Powerpoint presentation, activity, information sheet and work sheet including finding random and representative samples, questionnaire design etc.
		Price at the Pump (starter) Discuss what factors affect petrol prices at different petrol stations and how you could collect data to investigate the ideas generated.
		Indicators of Child Well-being (skills activity) Excel spreadsheet contains indicators of individual and social well-being of children in various countries. Separate Teacher Notes give suggestions for their use.
Statistical Diagrams (6 hours)	Draw and interpret back-to-back stem and leaf diagrams and histograms (including grouping of data). Describe the shape of distributions using terms such as symmetrical, skewed, multi-modal. (Measures of skewness not required.)	Trends (skills activity) Excel spreadsheet containing large sets of data concerning marriages, household expenditure and deaths.
		Datasets (skills activity) Data concerning road accidents, causes of mortality, marriage, divorce and food consumption in an Excel spreadsheet.
		Histogram (skills activity) Instructions explaining how to construct an accurate histogram and frequency polygon in Excel.
		Graphic Calculators (starter) Powerpoint presentation that introduces students to the Casio fx-7400G PLUS calculator. Contributed by Richard Tarry of Tower Hamlets College.



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Statistical Measures and Further Diagrams (8 hours)	Find the mean (\bar{x}), mode, median, range, inter-quartile range and standard deviation of data (both σ_n and σ_{n-1}) from a list and from a frequency table. Use a calculator to find \bar{x} , σ_n and σ_{n-1} (and also a spreadsheet if possible). Consider the effect of outliers. Draw and use a cumulative frequency graph to find the median, percentiles, upper and lower quartiles and interquartile range. Draw and interpret box and whisker plots.	Casio Calculators (skills activity) Instructions for using a Casio fx83WA or fx85WA to find the mean and standard deviation.
		Cumulative frequency graphs in Excel (skills activity) Activity that shows students how to draw a cumulative frequency graph in Excel.
		Box and Whisker Plots (skills activity) Students can use this Excel spreadsheet to draw up to 4 box and whisker plots. Includes instructions.
		Athletics (skills activity) Excel spreadsheet contains large datasets of track and field events. Separate Teacher Notes give suggestions for their use.
Compare data sets (8 hours)	Compare and contrast data sets using measures of location and spread and statistical diagrams. Justify choice of statistical diagrams and measures.	Subjects (skills activity) Spreadsheet containing recent A level results in 13 subjects. Use for practice of spreadsheet skills.
		Election Results (skills activity) Spreadsheet containing the 2001 and 2005 General Election Results. For practice of spreadsheet skills.
Bivariate Data (10 hours)	Plot scatter diagrams of bivariate data, including the use of mean values and draw a line of best fit by eye. Discuss positive, negative, strong, weak and no correlation. Introduce the principle of least squares, regression lines and Pearson's product moment correlation coefficient (r). Use a calculator to find r and regression line coefficients and interpret the results. (Also include the use of a spreadsheet if possible.) Discuss the fact that correlation does not imply causation, that r is only a measure of <i>linear</i> correlation and that not all relationships are linear.	DISCUSS Correlation & Regression (skills activity) Simulations to aid understanding. Internet access needed.
		Casio Calculators (skills activity) Instructions for using a Casio fx83WA or fx85WA to find the product moment correlation coefficient and regression line of y on x .
		Correlation (skills activity) Students find product moment correlation coefficients, draw scatter graphs and summarise the results
		Climate (skills activity) Excel spreadsheet containing sunshine, rainfall and temperature data for England and Wales, Northern Ireland and Scotland for each month in every year from 1961 to 2003.
		Anthropometric Data (assignment) Excel Spreadsheet contains anthropometric data from a large sample of children and young adults. Teacher notes give suggestions for practice of statistical techniques.
		Mammals (assignment) Data sheets giving body mass, brain mass, sleep duration, life span, gestation time and danger index for small, medium and large mammals. Assignment based on the data and suggestions for alternative uses. Optional use of spreadsheet.
		Module Results (skills activity) Students analyse and compare results for two modules. Includes use of Excel and Autograph as well as diagrams and calculations done by hand.



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The Normal Distribution (10 hours)	<p>The use of theoretical probability distributions to model populations.</p> <p>Features of a normal distribution, including:</p> <ul style="list-style-type: none"> • continuous data • symmetry • approximately two-thirds of the distribution lying within one standard deviation of the mean • approximately 95% of the distribution lying within two standard deviations of the mean <p>The standard normal distribution with mean 0 and variance 1.</p> <p>Use of tables to find probabilities and expected frequencies.</p> <p>Use of tables in reverse calculations.</p>	<p>Stature (starter)</p> <p>Data sheet gives the heights of samples of men and women from 8 countries. Student worksheet leads to main features of samples from normal distributions. Optional use of spreadsheet. Teacher Notes included.</p>
		<p>Pulse Rates (skills activity)</p> <p>Experiment to find the effect of exercise on pulse rates. Spreadsheet gives results from such an experiment carried out over a number of years by Dr Richard Wilson at the University of Queensland.</p>
		<p>Health Data (skills activity)</p> <p>Data sets involving the health of adults and children in the UK and information about hospital waiting lists etc.</p>
		<p>DISCUSS Sampling (skills activity)</p> <p>Simulations to aid understanding of how variation occurs within and between samples. Internet access needed. Teacher Notes included.</p>
Critical Thinking (6 hours) Could omit if short of time	Examine statistical work produced by others with a questioning and critical approach. Consider the initial data and the statistical charts, graphs and measures that were used to analyse the data and the validity of any conclusions reached.	Global Warming (assignment) Gives a list of websites that have reports or articles about global warming including statistical evidence. Students analyse one or more of these reports to meet the second portfolio requirement.
Revision (8 hours)	Revise topics and try past papers. Discuss Data Sheet – make up and try questions based on it.	