

Scheme of work – Cambridge IGCSE[®] Mathematics (US) 0444

Unit 10: Statistics (Core)

Recommended prior knowledge

Most of these skills will have been met before but will need developing further. An understanding of proportionality and percentage is required for pie charts in particular, so unit 1 must have been covered. Students also need to know how to plot on graph paper and to measure angles accurately.

Context

This is the second of two statistics units. Ideally this unit should be taught as a whole to link the areas of statistics together. It could also be tied to probability as well. Using charts to create theoretic probabilities of events occurring. It could therefore follow Unit 9 or be taught adjacent to it. Although the unit is split into separate skills groups there is an overlap between them. 10.1 and 10.3 go together and 10.1 can be used as a source data for 10.3, 10.4 and 10.8. Students who are following the extended syllabus will move through this faster but need to have all these skills in place before working on the extended units, or applying them in other areas of mathematics.

Outline

This unit is about the technical skills of statistics, but ideas are given to tie it to the data handling cycle so that the tasks do not appear meaningless. Although students only require technical skills for the syllabus teaching these without showing that charts, graphs, tables averages and range are a means of summarizing data to answer questions, would limit the rationale for the mathematics so sources have been given to allow statistics to be calculated to answer questions. Within the suggested teaching activities ideas are listed to identify and remediate misconceptions and to pull learning through to the required standard. The learning resources give both teaching ideas, summaries of the skills and investigative problems to develop the problem solving skills and a depth of understanding of the mathematics, through exploration and discussion.

Syllabus ref	Learning objectives	Suggested teaching activities	Learning resources
		All of the skills for developing statistics are summarized in this document with banks of problems and ideas for covering the full range both with IT and practically. It's philosophy is to tie together the data handling cycle of gathering data to answer a question, summarizing data in charts, averages measures of dispersion, interpreting data and concluding an answer to the question. This unit is about the technical skills from the middle stages of that cycle.	www.counton.org/resources/ks3frame/work/pdfs/specifying.pdf
		The 'censusatschool' gives a large bank of data for use in creating statistics to compare to other students school data.	http://rds.censusatschool.org.uk/

Syllabus ref	Learning objectives	Suggested teaching activities	Learning resources
CCSS: S-ID1		<p>General guidance A bank of questions and explanations.</p>	www.cimt.plymouth.ac.uk/projects/mentres/allgcse/bkb8.pdf
10.1	Reading and interpretation of graphs or tables of data	<p>General guidance Students need to be able to read information off charts, graphs and tables. The general problem is that they do not read the chart or try to understand it before approaching problems.</p> <p>Teaching activities Ask students to work in pairs and ask one to read a chart, table, graph to another student. They should read labels in charts and axes, read scales and work out what one square on graph paper represents. Describe the shape and detail. Summarise impressions. Pairs feedback to the class to see what they have found.</p> <p>Have a selection of charts and graphs from the press and ask students to write a paragraph for the paper on the chart (possible give them a headline i.e. if a chart has information about ages make a sweeping statement like older people). Pairs refine their descriptions. Class choose the best. They must back their case with comparative figures drawn from the data source.</p>	Past Paper 12 June 2011 Q11a (syllabus 0580)
10.2	Discrete and continuous data	<p>General guidance Students need to learn to set up frequency tables with discrete labels like shoe sizes or grouped data tables, with equal class intervals and non overlapping ends.</p> <p>They should know how to Add data to frequency tables using tally marks, but understanding that if you have a list you don't count up all the instances of one thing and put all the tally marks that instance at once, but go through the list as given, and put a tally mark and cross off.</p> <p>Connect this skill to 10.1 and 10.3.</p> <p>Teaching activities Give some practical cases, like collecting shoe sizes going around the room. Students tally as sizes are called out and check with hands showing after the tallying. Discuss discrepancy's and the likelihood of this happening in any data gathering, which is why large data sets are</p>	Past Paper 31 June 2011 Q8a (syllabus 0580)

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		<p>needed to increase the validity of conclusions.</p> <p>Complete frequency tables from bar charts, pictograms scatter diagrams, and line graphs.</p>	
<p>10.3</p> <p>CCSS: S-ID1</p>	<p>Compound bar chart, dot plots, line graph, pie chart, simple frequency distributions, scatter diagram</p>	<p>General guidance Students need experience of constructing all of these.</p> <p>Ensure</p> <ul style="list-style-type: none"> • Axes have titles, and are labelled appropriately for either discrete (with gaps) or continuous and charts have titles • Colour is used appropriately on bar charts. Two colours only for comparable bars on the same chart. i.e. male and female • Students realise that pie charts do not give exact numbers for each portion unless the total is known. Link to proportionality Unit 1 • Students know scatters can only be drawn if the paired data is available as pairs and not from frequency tables <p>Link back to 10.1</p> <p>Teaching activities Give students a bank of pie and bar charts and ask if any could be the same data. Rig it so that two or three bar charts have the same proportions to one pie chart to emphasis the proportionality of pies.</p> <p>Students can invent questions that can be answered from a set of charts of all types and then swap them. Ask students to add some that cannot be answered to give greater depth to the task.</p>	<p>www.censusatschool.org.uk/get-data/results/phase10</p> <p>Past Paper 11 June 2011 Q16 (syllabus 0580)</p> <p>Past Paper 32 June 2011 Q6b (syllabus 0580)</p>
<p>10.4</p>	<p>Mean, mode, median, and range from lists of discrete data</p>	<p>General guidance Ensure students know how to calculate/find all three averages. Students often mix up the non mathematical version of range with the mathematical and read the 'subtract' as 'to' so take 9-3 as 9 to 3 not as a range of 6. The other muddle is with the range of domain and range. Students need to understand the statistics version of range as a separate entity.</p> <p>Students need to understand why we have three averages and that Mode is the tallest bar on a bar chart or the largest slice of a pie chart.</p>	<p>Past Paper 31 June 2011 Q8b (syllabus 0580)</p> <p>Past Paper 32 June 2011 Q6a (syllabus 0580)</p>

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		<p>For median ensure students remember to order the data first and can deal with both odd and even numbers of items of data.</p> <p>Teaching activities Give students problems like the mean age of 8 people is 15 one more is added to the group the mean becomes 17 what was the new person's age? This will assess understanding of mean.</p> <p>Or tell students the median of four numbers is.... the range is.... and ask them to find possible solutions. This will test understanding of median and range.</p>	
10.8 CCSS: S-ID6	<p>Understanding and description of correlation (positive, negative, or zero) with reference to a scatter diagram</p> <p>Straight line of best fit (by eye) through the mean on a scatter diagram</p>	<p>General guidance Without seeing lines of best fit that are accurate students find it very difficult to see what they are aiming at achieving even if a definition is given, so ensure they have seen examples for correlation work (although of course a line of best fit is not needed to make that judgement so not all the examples should have a line of best fit).</p> <p>Students also need to be able to interpret the correlation into a relationship.</p> <p>Teaching activities This can be linked to gradient and intercept work as well to join mathematics up.</p> <p>Their science experiments may produce some data that can be treated this way.</p> <p>Take scatter graphs from the press and ask them to describe the correlation and write a headline for an article featuring the graph. e.g. Ice-cream sales against months - Negative correlation. Headline 'Ice cream sales plummet in cold snap' etc. A discussion of the veracity of headlines and actual data can also be added here.</p>	Past Paper 32 June 2011 Q6c (syllabus 0580)