Version : 1.0: 0708

## Free-Standing Mathematics Qualification

# Using and Applying Statistics 6990

*Advanced Level*

# Report on the Examination

*2008 examination - June series*

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk



Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334). Registered address: AQA, Divas Street, Manchester M15 6EX
*Dr Michael Cresswell Director General.*

# Using and Applying Statistics (6990) Examination

## *General*

The paper was accessible to its target group. There was no evidence of candidates running out of time. The majority of candidates scored marks on all of the questions on the paper. In general many candidates performed well, scoring above the mid 30s. It was evident, and pleasing, that many candidates were well prepared for questions 3 and 4, namely correlation and regression and calculating probabilities from a normal distribution. A minority of candidates appeared not to have a graphical calculator and, even worse, some appeared not to have any calculator in the exam. It is imperative that the candidates have a calculator in this exam and that they are proficient at using it.

Topics that were well done included:

- drawing a histogram;
- using a calculator to obtain means and standard deviations, the correlation coefficient and the equation of the regression line;
- understanding how a scatter diagram relates to the strength of correlation;
- identifying an outlier and understanding how its removal affects the mean and standard deviation;
- calculating probabilities for normal distributions.

Topics which candidates found difficult included:

- percentage change and reverse percentage change;
- comparing graphs;
- linear interpolation;
- plotting the line of best fit;
- relating the gradient of a regression line in context;
- plotting and using a cumulative frequency curve;
- obtaining a stratified sample.

## *Question 1*

In part (a) many candidates scored both marks giving the correct answer of 0.35% from correct working. Unfortunately a number of candidates incorrectly divided by the 2002 population (59321.7) rather than the correct 2001 population (59113.5). Although this led to the same answer, 0.35% to 2sf, it was penalised if the incorrect method was seen. Candidates who did not show working were given benefit of doubt. However, in almost all cases we would expect candidates to show their working. The only exception to this general rule would be when candidates are asked to use their calculators in a certain calculation.

Many candidates found part (b) difficult; they were not familiar with reverting from the 2004 population to the 1971 population. By far the most common error was to calculate 7.66% of the 2004 population and then subtract it.

In part (c) many candidates failed to compare the two graphs in a general way although often they would score 1 of the 2 marks available, eg by stating that the graphs were the same between 1997 and 1998. Many candidates referred to specific points on the graphs rather than the trends over time.

## *Question 2*

This question was well attempted by a large majority of candidates. Many scored all 4 marks in part (a) for drawing the correct histogram. Some candidates lost marks for having the first class interval starting at zero rather than 6. A few candidates clearly did not understand frequency density and did not know how to draw a histogram. A small number of candidates drew a frequency polygon.

Part (b) was more challenging and only the more able candidates scored both marks. The most common error was to not realise that 21 to 24 was only ¾ of the $20 \leq x < 24$ class. A minority of candidates left their answer as 47.5 and did not round off, hence losing the final mark.

## *Question 3*

This was a very well attempted question where many candidates scored at least 8 marks.
Candidates who used, and were proficient with, a graphical calculator had very few problems answering this question. Candidates with a non-graphical calculator would often make one or two mistakes in summarising the data and therefore lost 2 or 3 marks. It is strongly recommended that future candidates become familiar with the functions and menus on graphical calculators and that they have one available for this examination.

In part (b) very few candidates scored the 4 marks available. They knew that the line of best fit would pass through the means but they could not plot the correct means because they often misread the vertical scale. Only a few candidates actually calculated another point that the line would pass through but again plotting that accurately was beyond them.

In part (c) only a minority of candidates understood what the gradient represented in the context of this question. A large number of candidates would comment upon positive correlation or that as height increased so did foot lengths these were awarded 1 of the 2 marks.

Most candidates realised that the girls' scatter diagram was more spread out than the boys' and gained both marks in the final part.

## *Question 4*

In general many candidates scored all 3 marks in part (a)(i) and also scored the 2 marks for correctly comparing the boys' and the girls' means and standard deviations.

In part (b)(i) almost all candidates correctly identified 69 as the suspect girl's wrist circumference but others selected 180 or even 150. The conclusions about the effects of removing this value on the mean and standard deviation were well documented, showing a good understanding of outliers and their effects upon these statistics.

Part (c)(i) and (ii) were often fully correct with no working (from graphical calculators) or fully correct with full working shown. Many candidates scored full marks on this question. However, a few candidates were confused and had little idea of how to attempt part (c); others just left this part alone.

## *Question 5*

Most candidates failed to plot their cumulative frequencies at the upper class boundaries. With age and class intervals defined as <40, 40 – 49, 50 – 59, etc the upper class boundaries are 40, 50, 60 respectively. There was little care taken by candidates when plotting their points and often some were plotted at incorrect heights even though the cumulative frequency scale was 1 square per person and there was a given cumulative frequency curve already on the graph.

In part (c) quite a few candidates did not realise that the medians were at different vertical positions (25 and 33; or 25.5 and 33.5) and worse, a minority of candidates thought that these positions were the actual values of the median ages.

## *Question 6*

This was probably the most poorly attempted question on the paper. It is possible that candidates were confused by figures provided on the question paper that were merely copied from the Data Sheet.

In part (a) a number of candidates took the total of the professors rather than the totals of the females and males separately. This was really a misunderstanding in that they were calculating "the proportion of professors who are female" rather than "the proportion of females who are professors".

In part (b) there was often no method shown or working seen. A number of candidates did arrive at the correct decimals but failed to round to integers. A good number of candidates simply had the correct integers in the table scoring full marks but again with no working shown.

In the final part to this question candidates either had the fully correct answer or they simply added the 14.8% and 7.4% and then struggled to arrive at the given answer 8.9%.

**Turn over ►**

# Portfolio
# FSMQ Advanced Level – June 2008

The portfolios submitted for the Advanced FSMQ were generally of a good standard with most centres following the Specification carefully. It was very pleasing to see a great deal of independent work drawn from other subject areas, especially the fields of psychology and geology.

Most candidates who submitted portfolios under the **Working with Algebraic and Graphical Techniques** Specification produced at least two detailed investigations with the majority showing a good understanding of the method of linearisation (if linearisation is not carried out, the maximum mark achievable is 24). However, some candidates did not demonstrate sufficient use of algebraic techniques.

Some exciting portfolios were submitted under **Using and Applying Statistics,** with many candidates producing innovative work using tests of significance and Chi-Squared tests. For a mark of 40 to be awarded, these high level procedures must be present. Some very interesting critical analyses were produced by candidates.

Portfolios submitted under the **Modelling with Calculus** Specification were very varied, with a pleasing number of candidates relating their work to the real life problem and suggesting what might happen in various circumstances. This is the level of conclusion required for a high mark in Strand Three.

More centres submitted work under the **Using and Applying Decision Mathematics** Specification this year. There were some excellent portfolios which investigated some very relevant real life problems. Candidates who included a critical path analysis were able to achieve higher marks especially in Strand Three.

Overall, candidates should be encouraged to indicate when they are checking their work, as a high mark in Strand Two necessitates a thorough range of checks.

## *Mark Ranges and Award of Grades*

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.