



## **Free-Standing Mathematics Qualification**

# **Using and Applying Statistics 6990**

*Advanced Level*

## **Report on the Examination**

*2007 examination - June series*

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## *General*

Most candidates made a sensible attempt at every question and seemed well prepared. However, there was evidence that some candidates did not seem to have covered topics from the whole specification. Solutions were usually set out clearly so that methods were shown where it was appropriate to do so. Generally, candidates seemed prepared to use a calculator, as is advisable, for procedures such as evaluation of means or of a product-moment correlation coefficient.

Important points for students:

Adhere to the rubric of quoting answers to 3 significant figures or marks may be lost as a consequence. This is a particular problem in a question where a calculator is used and no method is seen so that rounding to 2 (or even 1) significant figures leads to loss of accuracy marks. A calculator should be used where possible, for example when calculating correlation coefficient, as this will save time and is more likely to result in an accurate answer. Double check the data entry to ensure the answer is correct. Supply written evidence of the method used in cases where the question requires a procedure to be explained. Comments should be in the context of the question involved. This is normally requested in the question.

## *Question 1*

Candidates generally made a very good effort at this question and the majority gained full marks in parts (a) and (b). Some candidates rounded their answers incorrectly in part (a) and lost marks. Comments in part (b) were well made and usually mentioned the general features as well as the most important feature that the mean weight for children with cystic fibrosis was dramatically lower than that for healthy children. In part (c), several candidates simply quoted the relevant numbers but did not provide the required written comment.

## *Question 2*

Parts (a) and (b) were answered accurately by many candidates, who seemed well prepared for this type of question and clearly showed all their workings. A significant number of students did not seem to have knowledge of this procedure. Many candidates did not quote their final answer to 3 significant figures. In part (c), candidates often forgot to refer to their answers found in parts (a) and (b), as required.

## *Question 3*

Some excellent solutions were seen in part (a) and the majority of candidates seemed well prepared for this type of question. Many candidates gave 28 as the answer to part (b) and did not scale the 14 frequency in the class  $95 \leq x < 100$  to estimate those school children over 96, rather than 95, pounds.

## *Question 4*

Candidates were generally well prepared for this type of question and knew how to use a calculator to obtain the product-moment correlation coefficient and the equation of the regression line. Answers were frequently not quoted to 3 significant figures. Sometimes the values of  $a$  and  $b$  were interchanged and marks were lost unless the figures were then correctly substituted into a regression equation. More experience of using a calculator might be the remedy for this confusion. Some candidates did not understand what the value of the product-moment correlation coefficient told them about the relationship between  $x$  and  $y$  and also were unable to interpret  $a$  as the rate of change of  $y$  with  $x$ . In part (b)(iii), candidates frequently substituted  $x = 40,000$  rather than  $x = 400$  into their regression equation. In part (b)(iv), candidates understood the dangers of extrapolation and explained this well.

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### **Question 5**

Very few fully correct solutions were seen and most candidates did not seem to understand how a stratified sample is obtained. In part (a), candidates usually identified two reasons and explained these well.

### **Question 6**

Candidates were either confident to use the given figures to evaluate the required items and did this quickly and accurately, gaining full marks, or they simply multiplied or divided any two numbers given on the data sheet without considering the problem fully and ended up with completely inappropriate and incorrect answers.

### **Question 7**

This was answered well by most candidates who were well prepared for this type of question.

### **Question 8**

In part (a), a significant number of candidates evaluated percentages for Belgium, not the UK. Some candidates explained in words or verified the percentages given rather than actually showing how they were calculated. Part (b) was well done and many correct solutions were seen in part (c), although too many candidates evaluated 99.2% of 1881.8, rather than finding  $1881.8 \div 1.008$ .

## ***Principal Moderator's Report***

### ***FSMQ Advanced Level – June 2007***

There were many very exciting, independently produced portfolios in Using and Applying Statistics, Modelling with Calculus and Working with Algebraic and Graphical Techniques. This is the first year that portfolios have been entered for Using and Applying Decision Mathematics. Just a few centres submitted portfolios but, again, a great deal of pleasing work was seen.

#### ***Working with Algebraic and Graphical Techniques Portfolios***

Most candidates produced at least two investigations for this portfolio. However, just a few centres failed to realise that it is essential for completeness that an investigation involving the fitting of a function to non-linear data by plotting a linear function is carried out. If such an investigation is not present, the maximum mark achievable is 24. There were excellent examples of the use of software for verification purposes but candidates are reminded that algebra techniques must be demonstrated in the investigations. Investigations involving two different types of function to model different parts of the data set were particularly well done by many centres.

#### ***Using and Applying Statistics Portfolios***

Candidates made excellent use of material from other subjects to produce very varied portfolios. Although some checking was carried out, candidates should make use of the statistical techniques they have already carried out to check further (for example, considering a scatter diagram and the correlation coefficient). The level of statistical work must be such that techniques beyond the core are demonstrated. For a grade A, more complex techniques such as Mann-Whitney, Wilcoxon, tests of significance or chi-squared tests should be carried out. Indeed, many candidates did use the chi-squared distribution to formulate hypotheses concerning their data.

It was pleasing to see some excellent statistical comments in the critical analysis coursework and many candidates provided alternative diagrams or measures which would illustrate the data more appropriately than those originally included in the reports.

### *Modelling with Calculus Portfolios*

Portfolios were more predictable here, although good examples taken from Physics were seen. Differential equations were well developed by many candidates and some excellent references to the original problem were made by the more able candidates. It must be remembered that, for a grade A, candidates should consider logs, trigonometry or exponential functions. Checking was carried out thoroughly by most candidates, with detailed comparisons being made between numerical methods and calculus methods.

### *Using and Applying Decision Mathematics Portfolios*

Although there were only a small number of entries, a great many were of a high standard. Most centres focussed on one network problem and one problem involving a critical path analysis. It is unlikely that a portfolio without a critical path analysis will show sufficient variety of decision mathematics techniques to be awarded a grade A.

The administration carried out by most centres was excellent and the samples were provided in a timely manner.

### *Mark Ranges and Award of Grades*

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.