



**Free Standing Mathematics Qualification  
June 2011**

**Mathematics Advanced Level                      6994**

**(Specification 6994)**

**Using and Applying Decision Mathematics**

***Report on the Examination***

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Set and published by the Assessment and Qualifications Alliance.

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Registered address: AQA, Devas Street, Manchester M15 6EX.

## General – Written Component

Most candidates were well prepared for this examination, though some candidates appeared not to have been taught all of the specification.

Candidates seemed to have few problems with time.

The paper seemed a fair test for the candidature and overall discriminated quite well.

### Question 1

Most candidates knew how to answer the first four parts.

Those candidates who used activities at nodes seemed thoroughly at home with the work.

Even more than in previous years, this was not true of those using activities on arcs. Most stated the correct critical activities in (d) but part (e) proved to be much more difficult for candidates. Most candidates scored well in part (f), but full marks were rare. This was due to failure to carefully indicate the floats.

Part (g) discriminated well, with only the very able candidates scoring any marks.

### Question 2

This question was a problem for some candidates, who did not understand Prim's or Kruskal's algorithms and persisted in finding a route. However, the question was generally well answered by the more able.

Some students attempted a correct application of Prim's algorithm but failed to indicate the *edges* involved correctly. These candidates had often done all their working within the table of the question.

Candidates should be aware that even where they have attempted to show the order of choice of vertices within the table it is not always clear to examiners precisely which edges are involved. Whatever method of working the algorithm is chosen, there should be an explicit statement of the order of choice of vertices.

In part (e) many candidates failed to make clear which edges were being deleted and added, offering only a sequence of apparently random numbers.

### Question 3

In general, candidates achieved more success here than on any other question. Dijkstra was much better understood than in previous years, with many students scoring full marks.

Some less able students seemed not to appreciate the requirement to make every detail of the application of the algorithm clear. Others presented shoddy and untidy work.

### Question 4

This question clearly differentiated between those candidates who could follow an algorithm and those who understood the method fully.

Some candidates made mistakes in calculating the distances between odd nodes.

### Question 5

In parts (a) and (b) the work often seemed to first be completed in the matrix and only then was there an attempt to write out the tour. Candidates are strongly advised to write the tour down in stages as the work progresses.

Part (c) proved to be challenging for the majority of candidates.

Candidates appeared to understand the method required in part (d) but had difficulty in explaining their method – edges were too often not defined by letter.

Candidates with answers to both of the first parts usually scored well on the last part. A few had problems with the inequalities, their statements taken as a whole being nonsensical.

## **Portfolio**

There were some excellent portfolios produced by centres which followed the principle of FSMQ to take data from other subjects and produce relevant mathematical analysis.

Some centres, however, gave out very prescriptive task sheets which did not always enable candidates to produce independent work. Candidates would benefit from more ‘open-ended tasks’ which would allow them to develop their work independently.

Most work was produced at the correct Advanced level but some centres produced ‘Using and Applying Statistics’ portfolios where no extension work was attempted, resulting in a bare pass mark. It should be noted that to obtain a Grade A for “Using and Applying Statistics” work on significance tests (such as t-test, Z test, Mann Whitney test, Wilcoxon signed rank test or the Chi-squared) should be attempted. Similarly candidates cannot be awarded a Grade A for ‘Modelling with Calculus’ unless there is evidence of differential equations and the differentiation/integration of functions such as trigonometry functions, exponential functions and so on.

Many centres developing ‘Working with Algebraic and Graphical Techniques’ portfolios produced excellent reports on the fitting of a function to non-linear data by plotting a linear function. Original data was also used in many cases. However, there were still some centres where candidates did not seem to fully understand the linearization process and could not explain their methods. Candidates producing portfolios which did not include algebra manipulation, such as equations, logarithms etc. could only achieve a mark in the mid thirties.

Candidates generally indicated when they were checking their work. Checking is an important part of the FSMQ ethos, so should be encouraged. Checking was particularly evident in ‘Modelling with Calculus’ portfolios where candidates were adept at comparing integration methods with numerical methods.

In Strand 3 there were some excellent conclusions drawn by many candidates. They considered how their initial data and assumptions affected their ‘real world’ findings and used mathematics to summarise their results. However, a few candidates seemed to ‘run out of steam’ and provided very brief conclusions.

Centres are to be congratulated on the hard work that was behind many portfolios, working with colleagues from other departments in order to obtain data and providing samples promptly for moderators.

## **Mark Ranges and Award of Grades**

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