



Free-Standing Mathematics Qualification

Working with Algebraic and Graphical Techniques 6991/2

Advanced Level

Report on the Examination

2007 examination - June series

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General

This paper was accessible to candidates with many showing that they were well prepared and that had sufficient time to complete the paper. The standard of presentation was usually good, but too many candidates did try to compress their answers onto one or two sides of paper and this made it more difficult to mark. The graphical questions were well answered in comparison with the algebraic questions, but some candidates just plotted the points, especially in questions 1 and 5, and then failed to join up the points. Many did not work to 3 significant figures and often truncated their answers. The descriptions of geometrical transformations were again very poor. Often the explanations did not link the model with the data. Too many gambled on using trial and improvement to solve equations and often scored no marks as their answers were not accurate enough. There were few candidates who scored less than 20 or more than 40.

Question 1

Many candidates made errors such as $(-20)^2 = -400$ so that the curve looked like a cubic rather than a quadratic, and the value at $x = 30$ was often plotted at 59 rather than 59.8. In part (b), 32.6 was a common answer from the candidates' cubic graph in part (a). Part (d) was not well answered, with most not using the word 'translation' but using 'shifted up', which was not allowed, and the stretch was usually along the x axis.

Question 2

This question was not well answered. Many candidates gave 459 and 240 in part (a) from $\sqrt{120} \times 10$ instead of $\sqrt{1200}$. Many gave answers for part (c) such as 'the dish is too low', 'it touches the wall', or 'it is below the ground' rather than using the equation. In part (d), 31.8 was a common answer from $350 + \sqrt{120} \times 1.8 = 369$.

Question 3

Most candidates answered part (a) correctly but some candidates did a line of best fit for the entire data. Many candidates did not attempt part (b) and some used a quadratic shape for $h = Ae^x + B$. All the sketches needed to have the correct curvature to earn a mark. Many candidates gave two ranges for part (c), such as 0 to 2 and 4 to 6, and interpreted the data rather than the model in part (c), with answers such as 'after 20 years they stop growing'. In part (e), a common answer was $h = A\sqrt{x} + B$.

Question 4

Many candidates got $\ln P = \ln(Ae^{kt})$ as the start of part(a)(i) but then made errors such as ' $\ln e + \ln kt$ '. Parts (ii) and (iii) were well done but some candidates gave the values to 4 significant figures in the table of values. Many got the values of A and k the wrong way around in part (iv) and $A = 3.58$ was often seen without $e^{3.58}$.

In part (b)(i), many gave 'the y intercept' which was not allowed and some said it was the gradient of the curve. Some candidates substituted $t = 2011$ rather than $t = 30$ in part (ii). Many gave an answer of 56.7 for part (iii) and forgot to add on 1981. $55 - 49.1 = e^{0.002t}$ was often seen. Most candidates scored at least 1 mark in part (iv) for knowing how to work out the percentage error even if their predicted population for 2001 was wrong.

Question 5

In part (a), many candidates missed the maximum at (9,17.7). 17.2 was the common answer for part (b)(i), but part (ii) was mostly answered correctly. Many did not draw a tangent for part (c)(i) but did the gradient of a chord. However, parts (ii) and (iii) were usually correct. In part (d)(i), answers of 16, -8 and $8\cos$ were common and 20 was the usual answer for part (ii). Some tried to solve equations in part (e), always unsuccessfully, but it was pleasing to see some score marks on this difficult last part.

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.