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Free Standing Mathematics Qualification
June 2011

Mathematics Advanced Level 6991

(Specification 6991)

Working with Algebraic and Graphical Techniques

Report on the Examination

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General – Written Component

The graphical questions were answered well compared with the algebraic questions. Many candidates did not work to 3 significant figures and often truncated their answers, which cost them marks. Too many gambled on using trial and improvement to solve equations and often scored no marks as their answers were not accurate enough. The descriptions of geometrical transformations were better this year. Often the explanations did not link the model with the data. Candidates should not write in blue ink as the scripts are scanned and often become difficult to read online

Question 1

Many plotted the end point at (350, 0) in part (a) but usually the graph was done well. Most only did one value in part (c)(i) and some gave the *y* value when x =100. Some did not draw a tangent in part (c)(ii) or drew a tangent but not at x = 60. Common errors in part (d) were 8 and 132. Part (e) was poorly done with many stating that *B* = 315 or 133 or *A* = 315. In part (f) some just stated that it gave the coordinates of the maximum point without specifying which was *A* and which was *B.*

Question 2

Many found it difficult to plot the points accurately in part (a), but their lines of best fit were correct on follow through in part (b). Some interchanged the values of *c* and *d* in part (c). Most did part (d)(i) well with the usual error being to substitute *t* = 2005 rather than *t* = 8 in their equation. Many got part (c)(ii) correct by trial and improvement rather than solving an equation, which was allowed. A common error was to take the square root rather than the cube root to find the value of *t*.

Question 3

Many lost marks through truncated values in part (a) but part (b) was done well. In part (c) many used $y = mx + c$ instead and so lost a mark. Part (d) was rarely attempted but some used an equivalent version of, for example, $S = e^{0.33t + 8.2}$ which scored full marks.

Question 4

In part (a)(i) common answers were 7000 and 3500 x 2^{10} = 3 584 000. Many divided by 112 000 in part (ii). Most started their graph in part (b) at the origin and many drew a straight line graph.

Question 5

Parts (a) (b) (c) and (d) were found to be difficult by many candidates, with many assuming the minimum was at midnight, and some just guessing the time for the maximum. Many only gave the first answer in part (e). Common answers in part (f)(i) were 36.8 and 1.3, whilst in part (f)(ii) the common answers were 15 and 30 but 0.65 and 12 were also seen.
Many still used 'shift up' in parts (g) and (h) instead of 'translation' which was not allowed.
In part (h) 'compresses' or 'squash' were seen and these were also not allowed.

Question 6

This was very poorly answered with most candidates reflecting the curve in the lines x = 6

or, more rarely, $y = 8$. A few who plotted the points correctly did not join them up, or gave the wrong curvature at the end points.

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 allow the candidates to develop their work independently.

Mostly, work was produced at the correct Advanced level but there were still centres producing 'Using and Applying Statistics' portfolios where no extension work was attempted. This resulted in a bare pass mark as there was no Advanced level work. It should also be remembered 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 lastly in providing samples promptly for moderators.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics pages of the AQA Website.

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