



**Free-Standing Mathematics Qualification**

**Working with Algebraic and  
Graphical Techniques 6991**

*Advanced Level*

**Report on the Examination**

*2008 examination - June series*

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## Working with Algebraic and Graphical Techniques (6991) Examination

### General

This paper was accessible to candidates, with many showing that they were well prepared and they 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 did just plot 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 better this year. 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

The plotting of points was good, but some drew their curve more than  $\frac{1}{2}$  a square from the point at (20,0). In part (b) some only gave the value of 100 and in part (c) some gave answers of 18 or 19. Weaker candidates only scored 6 marks for this question as they did not attempt part (d). In part (d)(i) most scored full marks or no marks with some errors being  $q = -10$  and  $p = -100$ . Many did not relate part (ii) to the context of the question and stated that  $(q, p)$  was the coordinate of the maximum point, which scored no marks.

### Question 2

Most got the values correct, with the usual error being to give the values to 4 d.p.

In part (b) some drew the graph of  $S$  against  $\frac{1}{S}$  but most could do valid lines of best fit for their data.

In part (c) most knew that  $a$  gave the gradient but some candidates drew small triangles so that their answer was outside the allowed range.

In part (d)(ii) many made mistakes in rearranging the equation and  $S = \frac{a}{C} + b$  or  $CS = a + b$

were common, and  $S = 55$  was often used instead of  $C = 55$ .

Most could not do part (e) and reflected in  $x + y = 100$  or  $x = 45$  or  $x = 50$  and although (50, 50) was seen the other two points were rarely seen.

### Question 3

This question rescued many weaker candidates, with many scoring the first 10 marks. In part (a)(i) the usual errors were to use  $t$  as 1998 or calculate  $(10.2 \times 1.0529)^8$ . Many did part (ii) by trial and improvement but usually got the correct answer, and errors were solving  $30\,000\,000 = 10.2 \times 1.0529^t$  or  $(30 - 10.2) = 1.0529^t$  with some leaving the answer as  $t = 21$  for 2 marks. Similar errors were made in part (b) and some truncated their answer to 18.4 in part (i).

In part (ii) some did trial and improvement and used values of  $t$  every 5 years and so gave an answer of 2035, which scored no marks. Most stated that the model gave a negative number of passengers in part (c), which was not allowed. In part (d) many had the two models starting at the same point and then the first model above the second, which scored no marks. Some drew part of the sketch with one crossover and so scored two marks.

### **Question 4**

In part (a), part (i) was usually correct with  $6.2\sin 120$  being a common error but many only gave one answer in part (ii), usually 7. Most drew a tangent in part (ii) but most gave the gradient as positive and a few drew a tangent at  $t = 2$  or  $t = 6$ . In part (iv) a few gave the units as degrees or change of height per hour. In part (b) some gave the predicted value as 3 or used radians and gave 5.03, but most did divide by 2.95 rather than 2.9. Errors in part (c) were to use 'shifted up' or 'squashed' neither of which was allowed. Many stated that the model could only be used at certain times rather than commenting that the model had constant amplitude whereas the real data had decreasing amplitude or equivalent words.

### **Question 5**

In part (a) many only scored 3 marks as they did not plot the maximum and minimum points. In part (b) parts (iv) and (v) were usually correct, but many did not realise that the answers to parts (i) (iii) and (iv) had to be exact and often gave part (iii) as 5.79 for example. Many gave part (ii) as 360 or 28 or 24 or 336 or  $360 \div 28$ .

A common error in part (v) was to give 18 or 6 pm as it is halfway between 12 and 24.

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.