Mathematical Methods

2010 ASSESSMENT REPORT

Mathematics Learning Area

Government of South Australia

SACE Board of SA

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ASSESSMENT COMPONENT 3: EXAMINATION

General Comments

The number of students who sat this examination has steadied at about 1350 and the overall results were sound, with the average achievement being approximately 59.5%. The examination is designed to assess the extent to which the student is able to demonstrate their mathematical skills and understanding, both with and without electronic technology, and their ability to analyse, interpret, and communicate results and information.

There were many successful results, which demonstrate teachers' efforts throughout the year in encouraging students to give responses within the context of the question. It was pleasing to see most students attempting and achieving some success in all questions. Routine skills and applications were generally well handled.

To enable students to proceed further through some questions, students were given results and asked to 'clearly show' how these results could be achieved. This task proved to be quite difficult for many students, and was particularly noticeable when students were asked to find the derivative of functions. Also, the rules for differentiation were examined in quite a few questions, and there were many students who could not differentiate correctly.

The sensible rounding of numbers was attended to by the majority of students. It was noticeable that some students do have difficulty rounding numbers, and marks were deducted for not giving sensibly rounded responses.

Students' discerning use of electronic technology in the examination is encouraged. Students may use their calculator whenever they see an opportunity to do so. There is no need to indicate to the examiners when they have used their calculator. Too many students appear to be reluctant users of their graphics calculators.

The ability of many students to analyse and interpret results within the context of the question was pleasing. The intent of the examination was to enable students to give their personal mathematical responses to some of the contextual questions. Students should be aware that a 'stock standard' result taken from their pages of notes might not be an appropriate interpretation to a particular contextual question.

Question 1

Over 50% of the students achieved full marks for the question. There were few data input errors, although some students gave responses that were of incorrect dimension because they had copied what was on their calculator display.

Question 2

Well answered by most students. However, a significant number of students were unable to correctly use their calculator to find $\sqrt{10^2 + 4 \times 10 + 10}$ or similar. Some

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students were unable to handle the chain rule, with the square root causing the most problems. Brackets missing around the $2t + 4$ led many students to an incorrect answer in part (c)(ii). The explanations given in part (c)(iii) were generally accurate, although a considerable number of students missed the 'crocodiles per year'.

Question 3

Much of this question could have been done using technology — finding $f(3)$, solving $f(x) = 1$, and finding $f'(3)$. Many students were unable to find the equation of the tangent in part (f), with many giving $y = 2.66x + 2$ (the *y*-intercept for $f(x)$) as their answer.

Question 4

This question was handled well by the majority of the students, with more than 40% scoring 9 or more out of the possible 13 marks allocated. The most disappointing aspect of the responses was that some students did all the hard work and then did not answer the question — what was the optimal solution for maximising profit? Writing '(70, 30)' is not the correct response. Students also continue to give expressions when equations are required.

Question 5

Students begin to struggle when algebra is involved. The result to part (a) could have been obtained in a variety of ways, such as multiplication of matrices using algebra, or trial and error using matrix multiplication with the aid of the calculator. Part (c)(iii) was not well answered by students, with many unable to calculate the percentage change and unable to fully interpret their findings.

Question 6

This question was quite well attempted by students. Part (c) could have been solved using technology.

Question 7

The descriptive parts of this question proved to be the most difficult. In part (a), markers were looking for 'shape' and '$t = 0$ *t* = 0' as the differentiating aspects of the two given equations. In part (e)(ii), a correct response was of the form 'the rate of change of the number of students who had heard the rumour'. In part (e)(iii), $\frac{dN}{dt} \to 0$ was needed with an explanation.

Question 8

Only part (a) was marked. The remaining parts of the question were withdrawn from the examination paper for all students.

Question 9

Apart from the first question of the paper, the two linear programming questions gave students their greatest success. Well over 50% of the cohort scored 9 or more out of the allocated 13 marks. The most common error was giving inequality responses to

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parts (c)(i), (c)(ii), and (c)(iii), rather than giving equations as requested in the questions.

Question 10

Part (a)(i) was answered well. In part (a)(ii), many students did not use the continuity correction. Students who used their calculators to calculate the confidence interval in part (b)(i) had much greater success than those who attempted to use the formula provided on the formula sheet. Some students experienced difficulties explaining their answers in part (b)(ii).

Question 11

Few students realised that $\ln x$ is greater than 0, and fewer still could solve a quadratic that was > 0. Students could have used their calculators to good advantage here. Part (b) was usually done well, although this was a question where students seemed to forget all about rounding. Part (d) was similar to the other derivative questions and was generally unsuccessfully attempted.

Question 12

This is the third year in succession that part (a) or similar has been asked; however, incomplete answers are recurring. Part (e)(i) was well answered by most students, although there was some confusion about whether they were working with ρ or μ. Students who used their calculators had the greatest success in giving the correct interval. Part (e)(ii) was generally poorly answered, with perhaps the most common response being 'the mean of the sample lies between'.

Question 13

Students who were able to connect the information from different parts of this question were most successful. In part (a), the initial temperature was not 65 °C; in part (d), the rate of decrease in the temperature above room temperature was 1.99 °C per minute; and in part (h)(ii), the temperature of the water was 25 °C above room temperature. In part (g)(i), markers were looking for the statement $T = e^{-0.060t + 4.16}$ for the student to gain full marks for this part of the question.

Question 14

Many of the marks allocated to this question could have been obtained by a student's discerning use of their calculator. Most students who attempted part (e)(iii) neglected to refer to the 'concentration of nicotine'.

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