Scholarship

2012 Assessment Report

Mathematics with Calculus

COMMENTARY

The examination was slightly easier than previous years, and most candidates found they could attempt several questions.

In Question One, few candidates worked with the binomial expansion in part (a). In part (b), a common error resulted in the final answer containing h and w.

In Question Two, the alternate (and somewhat inferior) answer to part (a) containing $\tan^{-1}x^n$ was common. In part (b), many candidates falsely assumed that since the family of curves are normal to the ellipses, they must be straight lines. Part (c) was answered surprisingly well, although it was common to see answers which contained no mention of integration or differentiation.

In Question Three, part (b) in particular was answered well, with candidates showing a good understanding of the geometric context of de Moivre's Theorem. Some candidates struggled in part (a)(ii) in separating the odd and even cases correctly.

In Question Four, part (a) saw some candidates miss a mark by not explaining the steps of their working; some other candidates used the relationship between the arithmetic and geometric means. In part (b), many candidates could substitute $y^2=q^2x^2$ to find 0=0 but did not see what this meant. The trigonometric identity in part (c) was proved well by several candidates, although their working often started by assuming the identity was true and deriving a true statement, which is not strictly sufficient.

In Question Five, part (a) saw a number of candidates neglect to rearrange into the required form, having acquired a form that was close to the given answer, but with x and y transposed. However, it was pleasing to see most candidates knew that the gradient of a line is equal to the tangent of the angle it makes with the x-axis. Constructing a hyperbola of a specified form was also done well. Part (c) was the hardest in the examination, with some of the most beautiful mathematics used to answer it.

Teachers and students should look to the revised 2013 assessment schedule and exemplar examination for upcoming changes to Scholarship Mathematics with Calculus examination. In particular, questions will cover linear programming, systems of equations and critical path analysis, with some options within questions.

SCHOLARSHIP WITH OUTSTANDING PERFORMANCE

Candidates who were awarded Scholarship with Outstanding Performance typically:

- had a good working knowledge of the Factor Theorem
- worked with insight and flair
- formed novel, creative solutions
- demonstrated sound geometric reasoning
- simplified algebraic expressions purposefully
- worked well solving simple differential equations
- checked their answers, and self-corrected errors in working
- introduced new variables appropriately.

SCHOLARSHIP

Candidates who were awarded Scholarship but not Scholarship with Outstanding Performance typically:

- used diagrams where appropriate
- could fit a parabola to a specific model
- could determine when they had arrived at a valid solution
- made connections between parts of questions
- found applicable methods of solution to the more open-ended questions
- applied knowledge across different strands of the curriculum within questions
- could write clear explanations of their answers when required
- had strong algebraic manipulation skills.

OTHER CANDIDATES

Candidates who were not awarded Scholarship or Scholarship with Outstanding Performance typically:

- expanded without making use of the binomial theorem
- could not change the base of a logarithm correctly
- could distinguish between constants and variables when differentiating
- did not apply basic knowledge accessible on the formula sheet
- could not manipulate an algebraic expression into a specified form
- worked with decimals rather than exact forms
- did not give answers in the required forms
- lacked confidence with surds.