Assessment Report

New Zealand Scholarship Calculus 2017

Standard 93202

Part A: Commentary

Interest in the calculus scholarship examination is clearly growing. The number of candidates exceeded that of recent years. However, with a larger cohort comes a large range of ability.

At the upper end of the spectrum, the proficiency of technique and insight into the problems posed was very impressive. These candidates demonstrated exceptional algebraic skills. However, more pertinent to their success was the ability to analytically read the questions, deconstruct them and assemble an elegant solution demonstrating the rigour required of a top student of mathematics.

Many candidates struggled with this examination. While enthusiasm for scholarship calculus must be maintained, it is important to stress that a scholarship examination tests mathematical insight and proficiency across the entire curriculum. Such insight is demonstrated through problem-solving that may span more than one learning objective of the curriculum. There is an expectation that candidates should be able to move beyond “single task” problems and be able to apply their learning across the achievement standards rather than isolating their focus upon a collection of granular questions.

Nonetheless, it was encouraging to see the many valiant attempts from a wide range of candidates. There is much to be said for a student having the courage required to step up to a challenge deliberately aimed at identifying “top performance”.

Part B: Report on performance standard

Candidates who were awarded Scholarship with **Outstanding Performance** commonly:

- demonstrated a good understanding of the concepts covered in the mathematics curriculum
- knew the relationship between the nature of roots and coefficients of the equation
- understood the relationship between a function and its inverse and were able to find the inverse function
- integrated accurately using trigonometric identities
- generalised an expression beyond its initial terms
- showed excellent algebra manipulation skills
- used logarithm properties correctly
- solved simultaneous equations
- were able to differentiate implicit functions
- presented their working throughout their answer book logically and clearly
- recognised the difference of two squares

- identified a prime number
- were able to manipulate geometric sequences and series.

Candidates who were awarded **Scholarship** commonly:

- knew when to persevere and when to abandon a strategy
- applied the sum and product of the roots relationships successfully
- used trigonometric ratios succinctly to simplify an expression
- used the cosine rule correctly
- used implicit and/or logarithmic differentiation correctly
- knew how to apply De Moivre's theorem
- demonstrated proficiency in basic Level 1 geometry
- manipulated expressions involving trigonometric identities with flair.

Other candidates

Candidates who were **not** awarded Scholarship commonly:

- oversimplified or trivialised problems
- presented unplanned lengthy lines of working to solve a simultaneous equation
- failed to substitute appropriately and expand simple expressions like $(x+y-1)^3$ when the numeric value of x+y was clearly known
- were unable to find integer solutions of a multi-variable equation or provided inadequate explanation or working to support their solutions
- relied on their calculator to "guess and check" solutions when exact algebraic proof was explicitly required
- tried to find the roots of an algebraic equation when they were not required
- misused the relationship between an angle and the slope of a line, some thinking that a line twice as steep would make an angle double the size i.e. tan 2
