NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

LIVE

Home > Qualifications and standards > Awards > New Zealand Scholarship > Scholarship subjects > Calculus > Calculus Assessment Report

Assessment Report

New Zealand Scholarship
Calculus 2021

Standard 93202

Part A: Commentary

The assessment specifications for the Scholarship Calculus examination stress that the NZ Mathematics Curriculum is the material that is assessed, not the Achievement Standards. This immediately separated students who had covered most or all the curriculum from those who had been exposed to, or cherry picked, a limited suite of Achievement Standards. More specifically:

- most candidates attempted only the first three questions
- Question Three was the best performed question by most candidates, and candidates with a solid understanding of functions and symmetry did particularly well in 3d
- Question Four and Five required a solid understanding of algebra and calculus, along with experience and technique in problem solving
- candidates who were well prepared for this examination demonstrated flair and maturity in their solutions, which were efficient in the planning and execution of responses
- knowledge areas and skills which were commonly demonstrated by successful students were:
  - trigonometry – manipulation of identities and rational expressions
  - the foundational knowledge of functions – domains, ranges, and roots
  - geometry of complex numbers
  - conic sections, in particular loci
  - coordinate geometry.

Part B: Report on performance standard

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

- displayed a higher level of abstract thinking skills, and a thorough understanding of the subject across the Mathematics Curriculum
- solved at least two or three complete questions, and answered more part-questions correctly
- demonstrated excellent 'algebra' manipulation skills – were able to identify patterns in sequences, and were familiar with sigma notations, as in (Q4c)
- demonstrated a thorough understanding of 'functions', along with their domains and ranges (Q1a, b, Q4b)
- displayed competency in solving and interpreting contextually posed differential equation problems involving separable variables (Q4a, b)
- applied appropriate coordinate geometry skills in solving geometry question (Q5a)
- manipulated concisely and accurately 'trigonometry identities' (Q3a)
- demonstrated a thorough understanding of complex numbers (Q5b, d)
- displayed 'critical thinking' skills in 'proof questions' involving complex numbers (Q5d)
- showed understanding and knowledge of the Argand diagram and geometry of complex numbers, as well as conic sections (Q5c)
- showed in-depth understanding of the differentiation chain rule applied to composite functions (Q2d)

- showed clear communicational skills by setting out their solutions logically and adhering to the 'grammar' of mathematics.

Candidates who were awarded **Scholarship** commonly:

- applied their knowledge and skills to solve complex problems or problems in unfamiliar settings
- demonstrated good 'algebra' skills in solving equations, giving exact valued answers
- demonstrated good 'algebra skills' in manipulating complicated expressions involving logarithms (Q2a, e)
- demonstrated skill in manipulating trigonometry identities accurately (Q2c, 3a)
- integrated by parts or substitution (Q1d)
- demonstrated an ability in the creation of a mathematical model, and finding an optimised solution to the model using calculus concepts (Q2b)
- displayed logical thinking skills when applying the 'permutation/multiplication' rules (Q3d)
- showed good understanding of the modulus function in integration (Q1e).

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

- did not demonstrate strong algebraic skills
- did not show understanding of natural domains, the modulus function and symmetry (Q1)
- did not manipulate trigonometric identities
- did not simplify rational expressions
- did not demonstrate an understanding of the properties of the two roots of a quadratic equation (Q3a)
- did not solve a separable variable differential equation (Q4a)
- used a graphical calculator incorrectly to solve problems, where exact answers were required (Q1d, e)
- showed limited differentiation skills (Q2d)
- showed limited integration skills.

Subject page

Previous years' reports