

# 2025 NCEA Assessment Report

<b>Subject:</b>	Mathematics and Statistics
<b>Level:</b>	2
<b>Achievement standard(s):</b>	91261, 91262, 91267

## General commentary

Most candidates attempted all questions, and the grades awarded generally reflected the understanding and skills shown in their responses.

Candidates are reminded that showing clear working is important. Answers given without sufficient method are likely to be awarded Correct Answer Only, even if the final answer is correct.

A lack of basic algebra skills limited some candidates' ability to access questions across all three papers. Strength in these foundational skills is important for success at all levels. This was particularly evident when candidates were asked to work with expressions involving fractions.

Where more than one response was given, candidates are reminded to clearly indicate which answer they wish to be marked.

Candidates are encouraged to attempt every part of every question, as parts are not ordered by difficulty and may allow for achievement at different levels. They should read each question carefully and provide full justification for their answers, as clear reasoning supports higher achievement.

## Report on individual achievement standard(s)

### Achievement standard 91261: Apply algebraic methods in solving problems

#### Assessment

The questions assessed a candidate's understanding of algebra and their ability to apply skills and concepts to unfamiliar and familiar situations. The examination covered candidates' ability to manipulate algebraic expressions, determine the nature of the roots of a quadratic equation and form and solve linear, quadratic and logarithmic equations.

The assessment provided a good range of questions which were at appropriate levels of difficulty. The questions were innovative without being overwhelming for students, as questions were not too dissimilar from past papers.

#### Commentary

There were many candidates who gained zero overall despite having attempted most questions. This was disappointing and demonstrated a lack of very basic understanding of the algebraic skills required at this curriculum level. On the other hand, many capable candidates gained scores of 22 to 24, demonstrating eloquent algebra working in their answers.

## Grade awarding

Candidates who were awarded **Achievement** commonly:

- converted from surd form to index form
- manipulated a variety of algebraic expressions accurately
- simplified indices
- factorised quadratics
- solved log equations
- formed a quadratic equation from the solution.

Candidates who were awarded **Achievement with Merit** commonly:

- factorised and cancelled simple polynomials
- took clues / tips from the questions and started modelling
- applied methods in context, putting two concepts together
- solved simultaneous equations and quadratics equations
- manipulated logs
- used the discriminant to solve problems.

Candidates who were awarded **Achievement with Excellence** commonly:

- applied Pythagoras to a situation accurately and manipulated the resulting area expression effectively
- linked the discriminant to a problem and substituted to find both values of the simultaneous equations
- recognised the roots of an equation and equated equivalent terms successfully
- modelled a parabolic situation successfully and used their equation to solve a problem.

Candidates who were awarded **Not Achieved** commonly:

- expanded  $(2y)^3$  to give  $2y^3$  rather than  $8y^3$
- incorrectly dealt with negative numbers
- substituted incorrectly into algebraic expressions
- failed to manipulate expressions that involved surds, indices, or logs
- failed to solve problems involving quadratics
- started a question, but lacked basic algebraic skills (factorising, substitution etc) to make much progress with it.

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## Achievement standard 91262: Apply calculus methods in solving problems

### Assessment

The questions assessed a candidate's understanding of calculus, and their ability to apply skills and concepts to unfamiliar and familiar situations.

Overall, the assessment provided students with multiple opportunities to demonstrate achievement at all levels of the standard.

### Commentary

When graphing derived functions, candidates should use a single smooth curve with correct x-intercepts and a symmetrical shape.

Care is needed when substituting negative numbers or working with fractions in expressions, including when differentiating.

In kinematics questions, including the "+ c" term, and showing how it is calculated is necessary for higher-level achievement.

Candidates should provide full justification for their answers. Using methods such as the second derivative test or checking gradients around critical points strengthens reasoning and can improve marks.

Differentiating expressions with additional constants was generally well-handled by many candidates.

## Grade awarding

Candidates who were awarded **Achievement** commonly:

- understood the relationship between a function's derivative and its gradient
- differentiated polynomial functions with whole-number or rational coefficients
- evaluated a derivative at given  $x$ -values, including both integer and rational inputs
- found a general anti-derivative and included the constant of integration ( $c$ )
- applied the basic kinematics relationships between displacement ( $s$ ), velocity ( $v$ ), and acceleration ( $a$ )
- interpreted and solved straightforward rates-of-change problems.

Candidates who were awarded **Achievement with Merit** commonly:

- understood the relationship between a function's derivative and its gradient
- differentiated polynomial functions with whole-number or rational coefficients evaluated at a derivative given  $x$
- carried out several accurate, sequential steps towards solving a problem
- formed and solved simultaneous equations correctly
- derived a valid expression for distance when given an acceleration function or a valid expression for distance given velocity
- determined the constant of integration in kinematics problems, showing clear working
- identified a tangent to a curve and the correct equation of the tangent line
- understood the relationship between a function and its gradient graph, using key features to accurately determine or sketch the gradient function
- found the anti-derivative of a function accurately
- worked confidently and correctly with integer and rational values.

Candidates who were awarded **Achievement with Excellence** commonly:

- moved beyond routine procedures by engaging confidently with complex situations and applying multi-step methods accurately, with minimal errors
- communicated deeper understanding by explaining and justifying their methods; for example, justifying the nature of turning points or identifying key features of a function, even when not explicitly requested
- interpreted gradients, areas, and volumes meaningfully within real-world contexts
- correctly formed equations, determined constants of integration, and evaluated whether solutions are reasonable in context
- used the second derivative, tested gradients either side of the turning points, or corrected identified the direction of the function and the relative positions of the turning points.

Candidates who were awarded **Not Achieved** commonly:

- made significant algebraic or simplification errors and struggled to solve one and two-step linear equations
- provided only a final answer with no supporting working
- substituted values incorrectly into the given function or derivative
- misinterpreted expressions such as  $-x^2$
- demonstrated limited understanding of calculus concepts, and were unable to decide when differentiation or integration was required
- omitted the constant of integration (+ c) when finding anti-derivatives
- misunderstood the relationship between the gradient and the derivative, instead substituting the gradient value into the original function
- misinterpreted the graphical relationship between a function and its derivative
- failed to sketch the gradient function
- failed to differentiate when a fraction was involved in an expression
- missed a term when integrating long functions.

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## Achievement standard 91267: Apply probability methods in solving problems

### Assessment

The questions assessed a candidate's understanding of probability and their ability to apply skills and concepts to unfamiliar and familiar situations.

The assessment allowed candidates to demonstrate their understanding across all aspects of the standard, including probability trees, two-way tables, and the normal distribution. There was a good mix of practical calculations and theory, giving opportunities for all candidates to demonstrate their knowledge.

Success required understanding all aspects of the content, including calculations, context, and underlying theory. Higher grades were awarded to candidates who showed deeper understanding and clear reasoning.

### Commentary

Candidates should read questions carefully and respond fully to what is being asked, including providing justification, reasoning, and evaluation where required.

Accuracy is important. Probabilities should be calculated to at least four decimal places, and final values for expected values should be rounded appropriately in context.

A strong understanding of conditional probability, relative risk, and interpretation of results is necessary to achieve higher grades. Confidence with calculations and reasoning supports Merit and Excellence achievement.

Using graphical calculators effectively can support accurate calculations and improve efficiency, and candidates are encouraged to develop these skills.

Preparation, including practice with previous examinations, is key. Candidates who are familiar with the style of assessment and have practiced all three core components are more likely to succeed.

Overall, candidates who combine careful reading, accurate working, clear reasoning, and thorough preparation are well placed to achieve at all levels.

## Grade awarding

Candidates who were awarded **Achievement** commonly:

- calculated basic probabilities within the context of a normal distribution problem, with or without the use of a graphical calculator
- calculated basic probabilities, with or without the support of a probability tree diagram
- calculated basic probabilities using information provided within a two-way table
- demonstrated deeper knowledge in one or two components of the content, but then very little, or none, in the third aspect, giving them an overall score within the range required for success at Achieved level
- found the z-value within a normal distribution problem, but then could not utilise this value to find the solution to inverse normal problems, or to find the standard deviation in normal distribution problems
- recognised and compared basic features (shape, centre, spread) of a distribution shown in a histogram graph
- found an approximate value for the median of a set of data provided in a graph
- recognised that a distribution was skewed or symmetrical because of the data provided
- recognised when a z-value should have a positive or negative value
- recognised when probabilities needed to be multiplied or added.

Candidates who were awarded **Achievement with Merit** commonly:

- found an expected value using probabilities found in a probability tree
- interpreted and used inverse normal distribution techniques to find a required maximum value, with or without the use of a graphical calculator
- demonstrated a sequence of steps to find a missing standard deviation value, with or without the use of a graphical calculator
- calculated relevant probability values that required the selection from multiple locations in two-way tables or probability trees
- found relevant probability values that required inverse calculations on a probability tree diagram
- recognised and compared two basic features (shape, centre, spread) of a distribution shown in a histogram graph, including numerical evidence to support their comments, using correct statistical vocabulary
- used relative risk theories to calculate required probabilities
- recognised when a z-value should have a positive or negative value
- presented their solutions in a clear manner and included annotated diagrams to support their evidence
- recognised and used conditional probability theories to calculate required probabilities in context
- formed an algebraic equation that represented a situation with probabilities shown on a tree.

Candidates who were awarded **Achievement with Excellence** commonly:

- used relative risk theories to calculate probabilities and interpreted those values appropriately, whilst responding to the validity of the claim
- recognised and interpreted statistical features of a normal distribution, and compared these features with an alternative distribution
- recognised why a given distribution may not be an appropriate distribution
- made relevant comments that could connect and compare estimated median, mean, quartiles and standard deviation values and shape, centres and spread of data

- recognised and compared all three basic features (shape, centre, spread) of a distribution shown in a histogram graph, including numerical evidence to support their comments and correct statistical vocabulary
- formed and solved an algebraic equation that represented a situation with probabilities shown on a tree
- communicated their solutions in a clear and precise manner, utilising annotated normal distribution and probability tree diagrams
- calculated and interpreted relative risk values from a two-way table and which the subsequent comments needed to relate to using precise language to respond to and evaluate a claim made
- made valid and appropriate comments to the responses that required deeper understanding and insight connecting values found and general theory.

Candidates who were awarded **Not Achieved** commonly:

- misunderstood when probabilities should be added and when they should be multiplied
- misunderstood appropriate statistical vocabulary or terminology
- answered select parts of the entire assessment, indicating a lack of knowledge and understanding of all three components of the achievement standard
- failed to find simple probabilities requiring use of normal distribution theories, a probability tree, or two-way tables
- submitted probability answers in which values were not in the range of  $0 < p < 1$
- lacked basic knowledge of fractions, decimals, percentages.