

2015 NCEA Assessment Report

Mathematics and Statistics Level 2 91261, 92162, 91267

Part A: Commentary

Sound algebra skills enhance performance across the assessments.

Use of graphics calculators enhance performance, however candidates must demonstrate the procedures stated in the question.

Checking of answers is important, and at times graphics calculators can be used to assist with this.

Candidates generally could transfer word statements into mathematical terms.

Candidates generally could communicate well using mathematical terms.

Part B: Report on standards

1. Assessment Report for 91261: Apply algebraic methods in solving problems

<p>Achieved</p>	<p>Candidates who were assessed as Achieved commonly:</p> <ul style="list-style-type: none"> • solved simple logarithmic equations, showing an understanding of the properties of logarithms and logarithmic statements • interpreted, in a mathematical context, the information presented in a question and could set up a mathematical model to solve that problem • factorised quadratic equations with the coefficient of x squared greater than one, and simplified the expression • made an appropriate substitution to form a quadratic equation • derived appropriate equations to model a practical situation and prove a relationship already given • manipulated expressions involving a range of exponents, surds and indices • rewrote an algebraic fraction equation to create a common denominator • understood the meaning of 'roots of an equation' and their relationship to the discriminant • used a graphics calculator to solve often quite complex problems without algebraic evidence.
<p>Not Achieved</p>	<p>Candidates who were assessed as Not Achieved commonly:</p> <ul style="list-style-type: none"> • did not demonstrate an understanding of the knowledge required by the standard with respect to indices, discriminants, roots and solutions to equations, real roots • were unable to rewrite a logarithmic expression or equation into index form • did not take logarithms when a power was to be calculated • failed to factorise quadratic equations fully to enable simplification or cancelled terms in algebraic fractions incorrectly • did not understand how to write an equation(s) to model a practical situation mathematically • lacked the confidence to know when an answer was correct and would go on to undo a perfectly correct response by applying incorrect simplification techniques • did not use their graphics calculator to check the validity of their answer.
<p>Achieved with Merit</p>	<p>Candidates who were assessed as Achieved with Merit commonly:</p> <ul style="list-style-type: none"> • demonstrated the ability to manipulate a range of algebraic expressions including logarithms, indices, fractions, rational expressions and factorising • could find a model for a situation in context, and derive an appropriate and meaningful solution • solved a range of equations including logarithmic, exponential and algebraic fractions • knew the relationship between the discriminant and roots of a quadratic equation or graph.

Achieved with Excellence	<p>Candidates who were assessed as Achieved with Excellence commonly:</p> <ul style="list-style-type: none"> • applied algebraic skills to solve an unfamiliar problem and determine all valid solutions • understood the properties of the discriminant and successfully used it to find all relevant solutions involving inequalities to solve a given problem and identify any constraints • were able to successfully develop an equation or equations to model a situation and use algebraic techniques to answer the problem in context • understood and applied the laws of indices and logarithms to solve an equation and identify constraints • used their knowledge of quadratics and factorising techniques to solve a problem after having made a suitable substitution and then determine all valid solutions.
Standard specific comments	<p>Algebraic techniques need to be demonstrated for candidates to gain credit beyond Achieved level.</p> <p>Any constraints which are relevant to either the context or algebraic answer need to be stated.</p> <p>Consideration should be given to checking answers to ensure their validity, and that the final answer represents the context of the question being asked.</p>

2. Assessment Report for 91262: Apply calculus methods in solving problems

Achieved	<p>Candidates who were assessed as Achieved commonly:</p> <ul style="list-style-type: none"> • could differentiate and substitute accurately • could make an equation equal to zero and rearrange to solve accurately • could evaluate the constant of integration • could differentiate and rearrange to solve • could differentiate an equation with variables.
Not Achieved	<p>Candidates who were assessed as Not Achieved commonly:</p> <ul style="list-style-type: none"> • could not find the constant of integration • did not know whether to differentiate or integrate • could not rearrange equations accurately • could not differentiate a term without a coefficient e.g. x • could not differentiate or integrate accurately when fractions were involved • could not differentiate or integrate accurately when negatives were involved.
Achieved with Merit	<p>Candidates who were assessed as Achieved with Merit commonly:</p> <ul style="list-style-type: none"> • could find the equation of a tangent to a curve • could differentiate a negative function, rearrange, substitute and interpret the solution in context • understood kinematics and the relationship between distance, velocity and acceleration • could interpret a rate of change scenario, write an accurate equation and solve it.
Achieved with Excellence	<p>Candidates who were assessed as Achieved with Excellence commonly:</p> <ul style="list-style-type: none"> • could justify the nature of turning points either with the 2nd derivative, graphically or by testing x values on either side of the turning point • could solve quadratics accurately by applying algebraic skills • could form and solve a model and link calculus to an algebraic problem • were able to correctly apply $<$ and $>$ signs • could interpret solutions in difficult contexts • could link calculus to the appropriate features of graphs • had very sound mathematical communication and working • fully understood kinematics and the relationship between distance, velocity and acceleration and could differentiate and integrate accurately using contextual information • could cope with a generalised expression, drawing its gradient function fully, with both intercepts described.

Standard specific comments	<p>A number of candidates struggled with defining when functions were decreasing as they often wrote $-1 > x > 3$.</p> <p>An inability to apply algebraic solving skills often cost candidates higher grades.</p>
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3. Assessment Report for 91267: Apply probability methods in solving problems

Achieved	<p>Candidates who were assessed as Achieved commonly:</p> <ul style="list-style-type: none"> • calculated probabilities using normal distribution tables, probability tree diagrams or graphics calculators • calculated a probability from a histogram • made two different relevant statements about a probability distribution graph and / or a histogram, about centre, shape or spread • calculated expected values • calculated absolute risk • calculated straight-forward probabilities from information expressed in contingency tables • calculated straight-forward probabilities from a tree diagram.
Not Achieved	<p>Candidates who were assessed as Not Achieved commonly:</p> <ul style="list-style-type: none"> • added or divided probabilities on probability tree diagrams • did not realise that proportions are probabilities • did not identify the group of interest when calculating a probability from a contingency table i.e. whole population of or a reduced sample space • gave probability answers which were greater than 1 • could not distinguish between the calculation of a Z-value and a probability • could not use a graphics calculator or normal distribution table to calculate probabilities • could not draw probability tree diagrams and use them as a tool to help solve probability problems • could not use statistical terms like modal group, median, mean, range correctly when referring to frequency histograms or probability distributions • could not cope with two separate tables.
Achieved with Merit	<p>Candidates who were assessed as Achieved with Merit commonly:</p> <ul style="list-style-type: none"> • used their graphics calculator to solve inverse normal distribution problems • calculated probabilities and percentages for multiple events using probability tree diagrams • calculated relative risk • completed a contingency table when given more complex information and used it to calculate probabilities • were able to make correct comparative statements about a frequency histogram and a continuous probability distribution and use numerical evidence to back up those statements.
Achieved with Excellence	<p>Candidates who were assessed as Achieved with Excellence commonly:</p> <ul style="list-style-type: none"> • used their graphics calculator to solve more complex normal distribution problems by either guess and check or algebraic methods • compared features of a frequency histogram and probability distribution by describing similarities/differences using correct statistical terms involving centre, shape and spread • determined relative risks and drew a conclusion relating to a claim about the events • solved a complex probability problem where two tables of probabilities were given and demonstrated that an understanding of the relationship and connection between the tables was needed to solve the problem.

<p>Standard specific comments</p>	<p>'Guess and check' is becoming a more common approach to solving problems in probability, especially where distributions are involved. It is important that algebraic skills continue to be taught, to find valid solutions.</p> <p>Candidates find comparisons of distributions difficult to describe. Assistance was provided to consider the three aspects of shape, centre and spread, and candidates were encouraged to provide numerical evidence to support their statements. Too often contradictory statements spoilt otherwise good, structured answers.</p> <p>Absolute and relative risk are well calculated, but their interpretation is less well done. It is important that comparisons between relative risks are expressed in realistic language to back up the numerical evidence.</p> <p>Candidates generally were able to construct a tree diagram from the information provided but struggled with the higher level questions associated with the diagram.</p> <p>Use of probability trees is important in solving some types of probability problems.</p> <p>Question 3(b) involved a question that was based on two tables and which may have been new to many candidates. This was not well done and candidates would be well-advised to prepare for this type of problem in the future.</p> <p>Premature rounding, careless rounding and truncating is becoming more of an issue with the solution of probability problems. The skill of retaining as much accuracy as possible until the final step, is one that would serve candidates well.</p>
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