NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

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Level 2 Mathematics and Statistics 2018

Standards 91261 91262 91267

Part A: Commentary

In general terms, students who were well prepared over the breadth of the examinable curriculum gained reward for their efforts and diligence. On the other hand, students who had gaps in their curriculum knowledge, or who gave only minimalistic answers, found it difficult to achieve each standard.

Markers were impressed with the high quality of many papers and the efforts of many students to set their responses out clearly and completely.

Part B: Report on standards

91261: Apply algebraic methods in solving problems

Candidates who were awarded **Achievement** commonly:

- simplified expressions by applying the rules of exponents
- factorised four terms by grouping pairs into a quadratic expression
- expanded two sets of brackets and simplified terms that included negatives
- solved simple logarithmic equations
- could simplify a rational expression involving powers and roots
- changed numbers written in different bases to ones all involving the same base
- re-arranged a quadratic equation to equal zero and solved it correctly.

Candidates whose work was assessed as **Not Achieved** commonly:

- were unable to combine two fractions with different denominators into a single fraction
- were unable to calculate correctly the discriminant of a quadratic that involved a negative coefficient for x
- were unable to deal with negative powers or rational powers correctly
- did not know how to find the surface area of a box or open box
- divided powers instead of subtracting them when dividing numbers written in the same base
- could not solve a simple quadratic equation correctly
- thought that negative roots of a quadratic equation were not allowed.
- lost the common factor when simplifying by factorising.

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

- substituted into a given exponential equation and solved it
- realised that if a number is a root of a quadratic, then the function is zero at that point, and could use this to evaluate an unknown variable
- expressed the difference of two fractions as a single fraction over a common denominator.
- when given an equation of a parabola for a word question, recognised the form and could use knowledge of the vertex to solve for an unknown variable

- knew what the discriminant of a quadratic equation meant in terms of equal roots, and the relationship with the related graph, and could use this correctly in context
- could use logs correctly to solve simple exponential equations
- were able to manipulate numbers in different bases and solve an equation with at least two variables.

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

- solved an extended word problem involving parabolas with little guidance
- had a very good knowledge of the relationship between the discriminant of a quadratic and its roots, and when a problem resulted in a second quadratic could solve this as well and relate it to the initial problem
- were able to form and solve an exponential equation correctly using logarithms to find a percentage increase
- used higher level expansion and factorisation to prove a given result.

Standard specific comments

There were many excellent scripts where a very high level of algebraic ability and precision were demonstrated.

Some candidates appeared to assume that they needed only to answer what they perceived as the Excellence level questions. Occasionally very good candidates were greatly disadvantaged by this strategy because of simple errors.

Most candidates showed a good mastery of expansion and factorisation.

Candidates who have a graphics calculator and good calculator skills are greatly advantaged in this standard.

91262: Apply calculus methods in solving problems

Candidates who were awarded **Achievement** commonly:

- differentiated correctly and found the gradient of a function at a given point
- formed appropriate equations for a contextual situation and took the derivative
- solved a derived equation to find the x ordinate (or relevant variable) for a local maximum or minimum
- differentiated a polynomial to form a derived equation with an inequality to represent when a function is increasing
- sketched the gradient function for a parabolic graph accurately, showing key features
- anti-differentiated kinematics equations for either acceleration or speed
- sketched the function for a parabolic graph from the graph of the derivative showing key features
- understood that turning points have a derivative equal to zero
- derived a function from the gradient equation and a known point having calculated the constant c
- formed and solved a derived equation that represented the rate of change for given information
- formed a derived equation for a function and equated this to a given slope.

Candidates whose work was assessed as **Not Achieved** commonly:

- used only algebraic procedures to answer a question when clearly instructed to use calculus methods
- did not differentiate or integrate correctly, particularly when dealing with polynomials that included either a constant term or non-numeric coefficients
- mis-understood that the gradient at a turning point was 0
- failed to form a derived equation equal to zero (or appropriate inequality) when dealing with a maximum/minimum (or increasing/decreasing) situation
- were unable to form a suitable equation to model the contextual situation from which calculus was then to be applied
- did not know whether to substitute the parameter or whether to solve the derived equation equal to that parameter

- forgot to include the constant of integration
- failed to provide sufficient evidence when asked to show or prove a given situation
- did not know the differences between the graph of a function and the graph of a gradient function or did not precisely show all the relevant features when drawing graphs
- made simple errors in calculations involving applications of calculus which could not be ignored at this level or such errors made the problem too difficult to solve
- could not substitute in the correct value for the gradient, even if it was stated in the question.

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

- showed relational thinking in order to correctly solve a problem using calculus techniques by interpreting the given information and using multiple steps
- clearly communicated their answer in context
- formed equations and differentiated to determine the rate of change for the situation presented and solved the problem
- equated a derived function to zero and determined the maximum or minimum values for a contextual problem
- were able to use anti-differentiation to solve kinematic problems that required a constant of integration to form a distance equation
- drew a cubic graph for a given gradient function accurately, showing all key features
- applied the derivative in relation to turning points and the x ordinates to form and solve equations with unknown variables
- justified with sufficient evidence that a turning point occurred at a given point
- formed the equation of the tangent at a given point and applied calculus techniques.

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

- demonstrated abstract thinking and understanding when using a range of calculus techniques

- showed clear and concise working with sound justification when applying calculus methods to answer a question
- applied strategies from other strands (e.g. graphing, coordinate geometry), demonstrated good algebraic skills, effectively utilised a graphics calculator and had no incorrect mathematical statements
- formed a model for a given situation and methodically applied calculus techniques to solve the problem with justification and clearly communicated the answer in context
- anti-differentiated acceleration and velocity equations to find the position of an object, having found and justified the constant of integration
- applied linked steps and an understanding of turning points to find unknown constants in an equation and determine the location of maximum and minimum turning points, with justification
- applied knowledge of a tangent equation to the function and evaluated an unknown constant to find the coordinates of a tangent's intersection to the equation
- could prove that a maximum or minimum situation exists either by the 2nd derivative test, investigating the slope either side or applying valid mathematical reasoning.

Standard specific comments

Candidates must apply calculus in solving problems for this standard.

Many candidates demonstrated a high level of competence in calculus and clearly communicated their answers along with well set out working.

Candidates need to use correct notation and / or mathematical conventions to ensure their knowledge and understanding can be clearly identified and rewarded.

A common area of weakness appears to be interpreting rate of change questions and an inability to provide an answer to the actual question.

Candidates who did not use a graphics calculator were disadvantaged. When graphics calculators are used to solve equations, care should be taken to ensure the answer to the question is explicit with all detail given and decisions around the candidate’s chosen solution need to be clearly stated.

Some careless errors when calculating may be ignored (MEI) if this results in a minor error that does not affect the level of difficulty of the problem, however this

often limits further progress in the answer. When an impossible or unlikely solution is obtained, this should be seen as a message to recheck prior working and attempt to ascertain where this careless mistake may have occurred.

91267: Apply probability methods in solving problems

Candidates who were awarded **Achievement** commonly:

- correctly answered the first two parts of each question
- were successful in the relative risk question but none of the others
- were reliant on the graphics calculator for the normal distribution question
- set up tree diagrams correctly and calculate simple combined probabilities
- organised information on a tree and use the probability tree to answer direct questions relating to probability
- formed probabilities from a table.

Candidates whose work was assessed as **Not Achieved** commonly:

- did not know that probabilities could not take values more than 1
- were unable to find simple probabilities for normal distribution using a table
- did not realise that questions involving two-way tables required a probability as an answer
- could not interpret text to answer practical non-numerical questions
- avoided questions involving the normal distribution
- were not able to interpret two-way table correctly
- could not construct a probability tree and use it correctly.

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

- having properly interpreted the questions, drew correct distribution curves using a graphics calculator or tables

- put proper signs to the z-values
- solved relative risk questions correctly
- produced well written and accurate answers to non-numerical questions
- analysed the weaknesses in probability scenarios
- demonstrated accurate calculations across all three major content and skill areas
- interpreted relative risk correctly
- used a graphics calculator to solve inverse normal problems
- used accurate tree diagrams successfully.

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

- demonstrated very good overall understanding of the concepts being assessed and used this understanding in the application of probability concepts to the context
- generalised the relationship between standard deviation and inter-quartile range
- solved and correctly interpreted the answers to relative risk questions
- interpreted more complicated probability problems that involved using some algebraic skills.

Standard specific comments

A significant number of students avoided question one - the normal distribution question. Overall, many students were not competent in all three areas of the standard, which led often to vastly different grades for the three questions, for the same student.

The use of a graphical calculator provides a clear advantage to candidates.

Too many students did not show sufficient working to provide appropriate evidence for their answers. Candidates need to be aware that a correct answer only is likely to be awarded a grade u. Similarly, the same comment would be valid for “guess and check” methods where a final answer lacks the necessary accuracy or doesn’t provide enough estimations to get a more accurate answer.

Some students truncated their decimal answers, which did not allow the marker to see sufficient evidence of their probability understanding.

Mathematics and Statistics subject page

Previous years' reports

2017 (PDF, 50KB)

2016 (PDF, 240KB)