Assessment Report
Level 2 Mathematics and Statistics 2017

Standards 91261 91262 91267

Part A: Commentary

Many candidates were well-versed in the skills and understandings relevant to the content being assessed and were able to demonstrate high levels of thinking in the context of an assessment.

On the other hand, a significant proportion of candidates did not possess the basic skills required at Level 2 and were therefore unable to make inroads into the papers. Skills that were lacking included:

- accuracy in handling negative numbers or brackets in algebra
- understanding about when to differentiate, when to integrate, or when to substitute a value into a (given) formula or solve an equation
- familiarity with the normal distribution or probability trees, or indeed that probability must be less than 1.

The use of a graphics calculator does provide an advantage and many candidates made the most of this. However, some did not seem to realise that they need to show working to justify their answers if they are to gain credit for thinking beyond Achievement level, as described in the Specifications. Equally, all standards require candidates to use thinking integral to that content area if they are to provide evidence of understanding. This means, for example, that candidates must use Calculus methods in solving problems in 91262 if they are to achieve that standard.

Part B: Report on standards

91261: Apply algebraic methods in solving problems

Candidates who were awarded **Achievement** commonly:

- manipulated negative powers and fractions
- factorised a quadratic expression, keeping the common factor
- converted between log and index form
- formed a quadratic equation from its roots
- understood a squared number could have both a positive and negative answer
- found the lowest common denominator of an algebraic fraction.

Candidates who were assessed as **Not Achieved** commonly:

- did not use brackets when subtracting two expressions
- could not write an equation from words
- did not use their calculator to work with fractional indices
- could not form an index equation when given the variables to substitute
- incorrectly changed squared, cubed or higher-powered numbers into their base form eg. 8 = 2 ^ 4
- lost the common factor when simplifying by factorising.

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

- recognised that a log could not have a negative base
- followed multiple steps when rearranging an algebraic fraction
- found the roots of a quadratic equation by using a graphics calculator or the quadratic formula
- found the discriminant of a quadratic equation and made sense of the nature of the roots
- changed an exponential equation into a common base and then worked with just the powers, rearranging to form and solve a quadratic equation.

Candidates who were awarded Achievement with Excellence commonly:

- developed and applied a quadratic model in context
- formed simultaneous equations, going on to solve for both solutions and putting the answer in context
- applied the laws of indices and logarithms to change the subject of a complex equation
- modelled a practical problem using rational expressions and solved it using sophisticated algebraic techniques
- applied their knowledge and understanding of a depreciation formula to solve a straightforward problem
- understood the relationship between the discriminant, the roots of a quadratic equation and where a quadratic graph crosses the x axis.

Standard specific comments

The level of algebraic reasoning shown by many candidates in this paper was very pleasing and some found the excellence questions accessible.

Most candidates appeared to have a good understanding of log and index form and this was done well. On the other hand, simple factorisation and expansion was often hampered by poor use of brackets and difficulty processing negative numbers.

Candidates with access to a graphics calculator had a clear advantage in this standard. Those candidates who used one regularly and were proficient in making connections between graphing and algebra skills found some questions quite straight-forward.

An area of concern is the interpretation of the discriminant, and what information it provides about the nature of quadratic roots and the position of a quadratic graph in relation to the x-axis.

Some candidates did not appear to have a clear idea on what to do when crossing out work. In general, crossed out work is not marked, although markers do go to some trouble to ensure that they understand the intention of the candidate. Candidates should ensure there is only one set of answers to be marked and that replacement working is clearly indicated.

91262: Apply calculus methods in solving problems

Candidates who were awarded **Achievement** commonly:

- differentiated a polynomial written in factorised form
- differentiated correctly and found the gradient of a function at a given point
- differentiated or anti-differentiated kinematics equations involving distance, speed and acceleration.
- solved a derived equation for a given slope to find the x ordinate for a tangent point
- sketched the gradient function for a parabolic graph accurately showing key features
- derived a function from the gradient equation and a known point having calculated the constant c
- formed appropriate equations for a contextual situation and took the derivative
- understood that turning points have a derivative equal to zero.

Candidates who were assessed as **Not Achieved** commonly:

- did not differentiate (or integrate) correctly, particularly when dealing with polynomials which included either a constant term or non-numeric coefficients
- could not decide from the context of the question whether to differentiate or integrate
- did not know when to substitute or when to solve, or could not substitute in the correct value for the gradient, even if it was stated in the question
- forgot to include the constant of integration.
- failed to provide sufficient evidence when asked to show or prove a given situation
- used only algebraic procedures to answer a question when clearly instructed to use calculus methods.
- did not know the differences between the graph of a function and the graph of a gradient function or did not precisely show the relevant features when drawing graphs
- made simple errors which could not be ignored at this level or which made the problem too difficult to solve.

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

- showed relational thinking in order to correctly solve a problem using calculus techniques by interpreting given information and use multiple steps
- formed the equation of the tangent at a given point
- found the coordinates of a tangent's intersection to the equation using the derivative and a given slope
- showed that the equation provided was the tangent to the function at a given point
- 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 the given point
- drew a cubic graph for a given gradient function accurately showing key features
- were able to use either differentiation or anti-differentiation to solve kinematic problems
- formed equations and differentiated to determine possible maximum or minimum values for a contextual problem.

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

- showed clear and concise working with sound justification when applying calculus methods to answer a question
- communicated the answer to the question in context
- applied knowledge of a tangent equation to the function and evaluated an unknown constant
- applied linked steps and an understanding of turning points to find unknown constants in an equation
- proved that a solution was a maximum, clearly stating solutions and communicating the answer to the questionin context

- 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
- anti-differentiated to find an expression for distance and justified that the answer was a maximum distance
- applied strategies from other strands (e.g. coordinate geometry, simultaneous equations), demonstrated good algebraic skills, utilised a graphics calculator and had no incorrect mathematical statements

Standard specific comments

Candidates must apply calculus in solving problems for this standard.

Some candidates made careless errors when substituting, calculating with BEDMAS or performing basic algebraic operations. If this resulted in a minor error that did not affect the level of difficulty of the problem, this may have been ignored.

When graphics calculators are used to solve equations, all solutions should be given and decisions which are accepted or excluded need to be stated.

91267: Apply probability methods in solving problems

Candidates who were awarded **Achievement** commonly:

- could state probabilities
- could draw a tree diagram and use it to find simple probabilities
- could find a proportion from a histogram
- calculated straightforward proportions from a histogram.

Candidates who were assessed as **Not Achieved** commonly:

- were unable to set up a tree diagram
- lacked understanding of the normal distribution
- were unable to successfully select two values from a table to write a correct proportion
- lacked the language skills to interpret the questions.

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

- could calculate relative risks
- could find normal distribution probabilities with or without a Graphics Calculator
- could solve Inverse normal problems given a probability
- could successfully draw and use a tree diagram
- gave numerical values when comparing distributions.

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

- could interpret relative risk in context
- could calculate conditional probabilities from tree diagrams
- applied an understanding of the normal distribution to find Standard Deviation
- were succinct in their comparison of data displays, addressing all of the aspects.

Mathematics and Statistics subject page

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