National Certificate of Educational Achievement

2012 Assessment Report

Mathematics and Statistics Level 2

91261   **Apply algebraic methods in solving problems**

91262   **Apply calculus methods in solving problems**

91267   **Apply probability methods in solving problems**

COMMENTARY

Candidates who persisted throughout the papers were well rewarded for their efforts.

The use of a Graphics Calculator was not essential but definitely assisted candidates in this assessment.

It is important that students show evidence (working) at all levels so that full or partial credit can be awarded, particularly when incorrect rounding has occurred or final answers have not been correctly presented for the context of the question.

Guess and check methods are not appropriate for demonstrating the required level of skills required.

The papers highlighted the need for students to be prepared in all areas of learning determined by the Achievement Standard as a lack of learning or understanding in one or more areas compromised the final result.

Candidates should write answers to suitable degree of accuracy.

Lack of appropriate number and algebra skills often let candidates down. Candidates who were able to draw on mathematical skills at lower levels were at an advantage.

STANDARD REPORTS

91261   Apply algebraic methods in solving problems

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:
- rearranged log statements correctly
- solved simple logarithmic equations, showing understanding of properties of logarithms
- factorised and solved quadratic equations
- showed understanding of the basic properties of indices
- successfully substituted into a formula involving exponents
- used a graphics calculator successfully to solve a quadratic equation
- demonstrated the skills required to factorise quadratics and solve them consistently
- were able to recognise when the use of the quadratic formula was appropriate and substitute into it accurately
- recognised when the discriminant should be used.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:
- were unfamiliar with basic logarithmic and index properties/principles
- factorised and/or expanded equations incorrectly
- cancelled terms in algebraic fractions incorrectly
- lacked an understanding of the use of a graphics calculator

- lacked basic algebraic manipulation skills
- were unable to interpret questions in context.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:
- comprehended word questions demonstrating competence in solving index/logarithmic equations
- demonstrated knowledge of quadratic equations including the use of the quadratic formula
- knew the relationship between the discriminant and real roots of a quadratic equation
- substituted into formulae accurately
- rearranged, factorised and simplified rational and quadratic equations successfully.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:
- solved equations in unfamiliar situations involving indices and applied algebraic logic to validate solutions
- showed good mastery of algebraic manipulation in complex situations
- were able to incorporate other strands of mathematics, like graphing, into their abstract thinking to evaluate a word problem
- knew the relationship between the discriminant and real roots and used it insightfully to find conditions on given parameters involving inequalities
- produced chains of reasoning that were logical and clearly expressed
- understood and applied laws of indices
- were able to successfully develop and apply a quadratic model in context.

91262   Apply calculus methods in solving problems

Many otherwise highly achieving candidates did not do well with optimisation and higher level rate of change problems.

Even weaker candidates were able to access the achieved level questions and those who persevered to the harder questions were often rewarded.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:
- differentiated correctly to find the gradient of a graph at a point
- anti-differentiated correctly and were able to substitute correctly to find the value of a constant
- recognised the need to differentiate a distance function to get a velocity
- recognised the need to anti-differentiate an acceleration function to get a velocity
- sketched correctly a gradient function from the original function

- found the x-coordinate of a point on a graph given the gradient
- recognised that a decreasing function had a negative gradient
- recognised the need to differentiate to find a rate of change
- chose correctly whether to integrate or differentiate
- differentiated functions correctly with correct substitution
- integrated functions correctly with correct calculations of any constants
- sketched a gradient function correctly.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:
- confused the need to differentiate and anti-differentiate
- had difficulty coping with fractions or decimals when completing the basic calculus operations
- could not substitute values correctly into expressions when required
- tried to solve problems without the use of calculus techniques
- had little understanding of the relationship between the gradient and the derivative of a function
- could not substitute in values correctly
- could not calculate a constant of integration
- found it difficult to graph a gradient function accurately.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:
- recognised that a minimum or maximum may occur when the derivative is equal to 0
- found a distance equation by anti-differentiating twice from an acceleration equation
- found the equation of a tangent to a curve
- found a range of x-values over which a curve is decreasing
- could sketch successfully an original function given the curve of the gradient function
- could differentiate or anti-differentiate more complex functions
- solved multi-step problems involving choosing the correct calculus method appropriate to the problem.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:
- could justify a minimum through the shape of the curve or a test of the gradients
- found a distance travelled from the acceleration function
- could justify a region of decrease by reference to the shape of the curve or by testing gradients
- could apply calculus techniques to problems where letters were used rather than numbers
- could work logically through an optimisation problem to successfully answer a question

- had a high level of understanding in applying concepts like area and kinematics in solving multi-step problems
- displayed a high level of algebraic skill.

91267   Apply probability methods in solving problems

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:
- calculated probabilities or percentages using either Normal Distribution Tables or a Graphics calculator
- calculated probabilities using Probability Tree Diagrams
- calculated probabilities or proportions from the information presented in contingency tables.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:
- did not have any calculator (often stated by candidates) or a graphics calculator to enable them to solve Normal Distribution problems
- were unable to solve Normal Distribution problems using the Standard Normal Distribution table provided
- wrote probabilities to only 1 significant figure without supporting evidence (i.e. no working)
- could not correctly add missing probabilities to a probability tree diagram
- gave their answer as a probability when a percentage was specifically asked for
- did not realise that proportions are probabilities
- could not complete a contingency table with the information provided
- did not identify the group of interest when calculating a probability from a contingency table
- gave insufficient evidence to support their 'relational thinking' or 'extended abstract thinking'
- continued to reiterate the same point when making a comparison.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:
- used their graphics calculator to solve more complex Normal Distribution problems (eg inverse normal distribution problems)
- applied calculated probabilities or proportions to determine the expected value for a situation and gave the answer as a whole number for a discrete situation
- compared features of a sample distribution with a Normal Distribution by partially describing similarities/differences using correct statistical terms
- calculated probabilities for multiple events using Probability Tree Diagrams
- could set up and solve a linear probability equation.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- applied their understanding of inverse Normal Probability situations to find an unknown parameter (e.g. could find a new mean or standard deviation)
- could compare in depth the features of a sample distribution with a Normal Distribution by fully describing similarities/differences using correct statistical terms
- found a conditional probability for an event using either an extended probability tree diagram or conditional probability rule
- determined relative risks and drew a conclusion relating to a claim about the events occurring.