Assessment Report

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Level 1 Mathematics and Statistics 2020

Standards 91028 91031 91037

Part A: Commentary

Both teachers and candidates should be fully aware of the concepts referred to within the relevant Mathematics Assessment Specifications: https://www.nzqa.govt.nz/ncea/subjects/assessment-specifications/mathematics-l1/

Candidates need to be aware that question parts may follow on from each other and be linked. Therefore, a candidate should be actively looking for this connection and, if necessary, turning to earlier pages in the booklet.

Candidates who have a suitable graphical calculator, and know how to use it effectively, could be advantaged. However, it must be noted that students will always be expected to demonstrate a thorough understanding of the mathematical concepts, rather than directly transferring results from a graphing calculator. As good mathematical practice, candidates should show intermediate steps in a logical manner and clearly communicate what is being calculated. By giving only the answer, candidates are likely to lose the opportunity to provide sufficient evidence for the higher grades and to have the possibility of minor errors ignored. Generally, the lack of intermediate steps is not likely to provide sufficient

evidence towards a grade higher than Achievement. Additionally, questions are always designed in a manner that ensures that the use of a graphical calculator is not essential.

Part B: Report on standards

91028: Investigate relationships between tables, equations and graphs

Candidates who were awarded **Achievement** commonly:

- understood and formed a straight-line equation from a graph or word problem
- understood and formed an equation of a parabola from its graph
- could draw part of an exponential graph
- could draw a parabola graph
- could use algebraic substitution to present information
- were able to interpret and construct either tables or graphs to present information.

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

- were unable to demonstrate sufficient knowledge relevant to tables, equations, graphs and their relationships
- could not choose the correct graph to represent the context provided in the question
- were not able to recognise and draw an exponential graph
- were not able to recognise and draw a parabola graph.

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

- were able to represent varying contexts with graphs and equations for two or more of quadratics, exponential, and linear functions
- could recognise and then draw an exponential equation, with sufficient accuracy, from a given equation

- could recognise and then produce the correct equation from a parabola graph in context
- could recognise the relationships between equations and graphs and then comment on some of their features
- could draw a straight-line graph from a given situation
- understood more than one transformation of graphs and how this affects their equation
- were able to utilise equations in order to solve problems
- were able to interpret both linear and quadratic word problems, with respect to the relationships between tables, equations and graphs
- were confident with linking equations and tables to graphs.

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

- were able to interpret the context of problems and relate this to tables, equations, and graphs
- could find the roots of a quadratic equation and interpret these in context
- understood the context of a problem that led to a parabola graph and interpret this
- were confident with recognising the relationships between all of equations, tables, and graphs in a variety of different contexts and make appropriate interpretations
- were able to find generalised equations necessary to solve word problems, using quadratic graphs and functions and make appropriate interpretations
- were able to find generalised equations necessary to solve word problems, using exponential graphs and functions and make appropriate interpretations
- were able to apply strong algebraic skills in the solving the graphical problems.

Standard-specific comments

Candidates should be familiar with all types of graph included in this Achievement Standard i.e. linear, quadratic, exponential, step, discrete and piece-wise graphs.

Knowledge of only linear graphs and / or only simple parabolas will generally not be sufficient for a candidate to gain success.

This standard looks at specifically the relationship between tables, equations, and graphs, so candidates need to be able to demonstrate knowledge of and interpret such relationships.

Candidates need to explain and justify their reasoning and show sufficient evidence to support their solutions, without relying on the graphical calculator.

Candidates need to be familiar with the relationship between the rate of change of a function and the gradient of its graph.

91031: Apply geometric reasoning in solving problems

Candidates who were assessed as **Achievement** commonly:

- were able to apply Pythagoras' theorem
- were able to apply the trigonometric ratios in solving simple problems
- knew the basic geometrical angle rules to identify unknown angles but included the correct geometrical reasons at only one step
- were able to use the theory of similar triangles
- provided correct answer only to their solutions.

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

- could not use trigonometric ratios correctly
- could not use Pythagoras' theorem correctly
- were not familiar with the various theorems of circle geometry
- were not familiar with the concept of similar triangles
- provided the correct answer without any supporting working or reasoning
- did not provide the appropriate and relevant geometric reasons
- made incorrect assumptions from the provided information and instructions, e.g. used Pythagoras' Theorem or the trigonometric ratios in non-right-angled triangles
- lacked basic geometric angle property knowledge.

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

- were confident in using a variety of geometrical angle rules, with sufficiently clear and detailed justification, to calculate an unknown angle
- could apply Pythagoras' Theorem to solve more complex problems
- could apply the trigonometric ratios to solve more complex problems
- solved problems that incorporated the knowledge and use of the properties of similar triangles
- were confident in using the circle geometry rules to solve a problem
- were able to make progress in solving problems necessitating knowledge and understanding of bearings
- made only partial progress in producing sufficient clarity and detail in the multiply steps necessary in completing a geometrical proof
- were able to link concepts to make significant progress in complex situations
- produced an incomplete chain of geometrical reasoning whilst solving the extended problems.

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

- could solve complex problems necessitating the use of bearings and support this with clear use of geometric reasoning
- used clear mathematical language
- correctly used and linked both geometrical and trigonometrical reasoning to solve complex problems in context
- showed confidence, knowledge and understanding when working with circle geometry
- communicated their thinking and solutions clearly and logically, using clear mathematical language
- correctly used and justified geometrical reasoning in completing geometrical proofs.

Standard-specific comments

Very few students were proficient at attempting proof questions successfully.

Students who are able to use algebraic skills are advantaged in some questions.

Candidates need to be aware that every line of a geometric proof must be accompanied by an appropriate geometric reason in order to target the higher grades. Candidates need to ensure that their calculators are in the essential "degree mode" when answering any trigonometry questions.

91037: Demonstrate understanding of chance and data

Candidates who were assessed as **Achievement** commonly:

- were able to calculate probabilities
- were able to draw an appropriate line of best fit in a scatter graph
- were able to compare means within a set of data
- were able to recognise similarities and differences in data
- were able to provide one reason / justification / feature / claim from a scatter graph
- were able to provide one reason / justification / feature / trend from a time series graph
- were able to provide one reason / justification / feature / claim from a box-and-whisker graph.

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

- were not able to solve a probability problem providing incorrect denominators
- were unable to make appropriate statistical statements
- did not provide evidence or justification for their responses
- could not read and interpret features of different types of statistical graphs.

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

- were able to provide at least two valid reasons / justifications / features / claims from a scatter graph
- were able to provide at least two valid reasons / justifications / features / trends from a time series graph

- were able to provide at least two valid reasons / justifications / features / claims from a box-and-whisker graph
- were able to provide appropriate comments in relation to a trend live in a bivariate data problem
- were able to utilise appropriate rules to deduce a correct inference from a box-and-whisker graph
- supported their claims with appropriate statistical reasoning and relating these to the data provided in the question
- understood the differences, validity and appropriateness of the different types of statistical graphs and were able to provide appropriate statements
- were able to solve problems involving simple conditional probability
- were able to evaluate claims providing appropriate and valid evidence
- used correct and appropriate statistical language.

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

- could provide at least three distinct, valid statistical reasons / justifications with evidence and with reference to the data and by referring to the appropriate graph
- demonstrated statistical understanding and insight
- were able to interpret confidently the context used in the question
- were able to communicate their thinking, ideas, interpretations and statistical knowledge clearly and succinctly, using correct statistical language and vocabulary, displaying abstract thinking in their understanding
- were able to critique the validity of claims made about a set of sample data with reference to data collection, sample size and sample frame
- were able to provide detailed and insightful comments in relation to a time series graph
- were able to construct relevant statistical comments in context
- were able to understand the sample and population relationship.

Standard-specific comments

Candidates generally had a good understanding of time series graphs and the interpretation of its features.

Candidates need to ensure that their comments are statistically based and justifications are made with reference to the graphs provided and data contained within them.

Candidates need to be much more specific about making the call in a box-and-whisker graph, with clear and detailed reference to the relative positions of the medians and the middle-50% boxes. If a candidate is selecting a comparison using the DBM/OVS then sufficient detail of the figures and their interpretation needs to be provided.

Some candidates do not read and interpret the given information in the question carefully and consequently do not provide answers with the relevant detail or responses. These responses need to demonstrate statistical understanding and evidence.

Mathematics and Statistics subject page

Previous years' reports

2019 (PDF, 300KB)

2018 (PDF, 124KB)

2017 (PDF, 48KB)

2016 (PDF, 244KB)