2023 NCEA Assessment Report

Subject: Numeracy

Achievement standard(s): 32406

General commentary

Candidates awarded **Achievement** commonly met all outcomes of the standard to the required level.

This included:

- formulating mathematical and statistical approaches to solve problems in context (Outcome 1)
- using mathematical and statistical procedures accurately to solve problems in context (Outcome 2)
- describing whether the claim, method selected, and/or calculation used by another person was reasonable, or not, and justifying their position using information provided (Outcome 3).

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

- did not meet the minimum requirement for a total from all 30 items, AND
- did not meet the minimum requirements of **all three** outcomes above.

Report on individual achievement standard

Achievement standard 32406: Numeracy

Outcome 1

The requirement of outcome 1, as stated in the standard, is to formulate mathematical and statistical approaches that meet the demands of a given situation.

This includes:

- making sense of the mathematical and statistical demands
- selecting an appropriate operation, representation, variable and/or method to solve the problem.

Observations

Candidates who met this outcome in the **Term 2 CAA** commonly:

- recognised how to apply an hourly rate to calculate a worker's total pay for 8 hours, including travel allowance
- divided a full turn (360⁰) into four, six, and eight equal parts, in a pizza-cutting context
- applied a rate of 1⅓ bins per hour, to work out the total pay of a kiwifruit picker for 10 hours
- worked out the probability of a card, beginning with K, being drawn from a collection of 14 cards
- recognised that division was required in a mass context
- found the multiplier (times as much) between the mass of two birds, expressed in different units, grams and kilograms
- estimated the height of a manu tukutuku, given a photograph of the object with width and scale shown
- expressed the multiplication calculation needed to find the total number of intersections in an array
- calculated the length of one side of an octagon, when given the perimeter
- found the number of 25 L bags of topsoil needed to fill a 0.8 m³ frame
- found the average amount of money raised by fundraisers, given the total amount and number of events
- calculated the total amount expected if a 5% increase occurs
- decided which front view matches the picture of a cupcake.

Candidates who met this outcome in the **Term 4 CAA** commonly:

- gave the cardinal compass direction for a path of travel
- used a scale on a map to estimate distance
- interpreted a 135° turn
- used a negative integer to represent a distance below sea level
- ordered decimals to two places
- read a bar graph to find the total frequency of two groups
- found the difference between two decimals in context
- interpreted a bar diagram to find a fraction of an amount
- found a percentage of an amount using a bar graph
- established which combinations of parties could form a government, given their percentage of the vote
- found a Cartesian product.

Candidates who **did not meet** this outcome:

- selected mathematical and statistical approaches that did not meet the demands of the situation or were unable to choose, or create, an appropriate mathematical model.

Outcome 2

The requirement of outcome 2, as stated in the standard, is to use mathematical and statistical procedures accurately in the situations. In general, the procedures required are achieved at the end of Level Four or beginning of Level Five of the New Zealand Curriculum.

Note that candidates have access to a calculator, as an assessment condition. Therefore, greater importance is attached to choosing a correct calculation than the method used.

Marker comments (specific):

Candidates who met this outcome in the **Term 2 CAA** commonly:

- gave an amount earned in 90 minutes by calculating the hourly pay rate
- calculated the cost of ¾ of 5 litres, at a price of $2.76 per litre
- read a bar graph, then calculate the total of frequencies for two categories
- calculated the percentage decline in kiwi numbers, given data for two time points
- read a time series line graph to find the number of votes cast in a particular year
- interpreted the scale on a map to find the total distance flown by a kea
- coordinated the south and east views of a pa to establish the position of a manu tukutuku in the top (plan) view
- found an internal angle of a regular octagon, given an external angle
- calculated the price of a garden bed after a 20% discount is applied
- from a list of ingredient costs, calculated the cost of making a single muffin (addition then division)
- found the length and width of a box, given an array diagram of cupcakes and the diameter of a single cupcake.

Candidates who met this outcome in the **Term 4 CAA** commonly:

- located a year on a given chronological scale
- found the multiplier between two lengths
- calculated the area of a basketball court in m^2
- located a given angle on a quarter turn diagram
- found an unknown factor in two equal products
- applied a word formula for a linear relationship
- used a unit square to estimate the total number of cows in an area
- found the correct reflection of a figure
- interpreted a rate to find an unknown factor
- used division to find an average
- calculated a percentage of an amount.

Candidates who **did not meet** this outcome:

- misinterpreted the question
- calculated or reasoned incorrectly
- selected an incorrect procedure.

Outcome 3

The requirement of outcome 3, as stated in the standard, is to describe whether the method selected and/or calculation used is reasonable and meets the demands of the situation. In the assessment, candidates interpret the mathematics and statistics used by others, take a position in terms of the appropriateness of the response, and justify that position using evidence from the situation and from their own experience.

Marker's comments (specific):

Candidates who met this outcome in the **Term 2 CAA** commonly:

- evaluated a claim about the number of linear metres required to create a deck (also involved area)
- evaluated a claim about the percentage of candidates in two groups who had part-time jobs, using a time-series graph
- used features of a time-series graph to verify that a claim about the kākāpo population is valid
- explained the calculations used by a gardener to calculate the area of an octagonal frame
- decided and justified whether or not a gardener has correctly planted a garden, in a ratio of 2:3
- interpreted a bar graph to evaluate a claim that one third of cupcakes sold are of a given flavour.

Candidates who met this outcome in the **Term 4 CAA** commonly:

- evaluated a claim about relative flight times, given departure and arrival times
- established the validity of a claim about equal playing times in a basketball game
- provided a probabilistic argument for a situation involving two independent events
- compared the donations by school candidates and adults using information in a dot plot
- evaluated a claim about the total distance walked by a cow, given a rate
- established the validity of a claim about the probability of an event using proportions
- established whether 1987 was an election year, using difference.

Candidates whose evidence **did not meet** this outcome commonly:

- did not take a position (usually any position is accepted if it is justified)
- left open response sections blank
- restated the claim without justifying their position using the available information
- created their own incorrect solution and argued with that solution.

Standard specific comments about candidate performance

Generally, candidates performed well on items that involved statistical literacy, especially interpreting line, and bar graphs. However, a bar graph showing percentages rather than frequencies proved to be difficult for candidates to apply. Some candidates also had difficulty with using the features of a distribution (e.g. centre, clustering) to create an argument. Generally, problems that involved choice from the four operations and calculation, including finding averages, were answered correctly by most candidates. However, finding the multiplier between two amounts was answered correctly by only 52% of candidates in Term 2 and 64% in Term 4. Straightforward rate calculations were done well, but the same competence was not evident in two ratio items. More complex multiplicative problems about

equivalent rates also proved to be difficult. Items involving fractions and increasing or decreasing an amount by a simple percentage tended to be poorly answered.

Measurement and geometry were areas of comparative weakness, as was reported in 2022. Issues included calculating with areas and volumes, converting between units of mass, and working with angles. Items involving interpretation of scale and coordinating views were poorly attempted. Candidates also performed poorly on items that involved partitioning a length to create a scale, indicating that more experience is needed on equally dividing sections of number lines. Probability items showed candidates tended to interpret chance situations with certainty rather than with uncertainty.

Outcome three required candidates to present a mathematical or statistical argument. Markers felt that candidates exhibited greater capacity in taking a position and writing an evidenced-based argument, than was apparent in 2022. There was evidence of candidates using the information and displays to support their position. Still, a discouraging proportion of candidates did not attempt items that required an open response.

Candidates will need continued support about how to take a mathematical or statistical position and argue for that position from evidence. The standard requires this aspect of critical numeracy.