# 2022 NCEA Assessment Report

## Standard number: US 32406: Use mathematics and statistics to meet the numeracy demands of a range of situations.

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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 method selected and/or calculation used by another person was reasonable and justified their position using information provided (Outcome 3).

Candidates assessed as **Not Achieved** commonly:

- did not complete all sections of the assessment or
- did not meet the requirements of all three Outcomes above, particularly in respect of Outcome 3.

### Standard specific comments

#### Outcome 1

The requirement of this outcome, 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.

#### Marker comments (specific)

Candidates who **met this outcome** were able to:

- find the total cost of 500 items at $8.00 per pack plus the fixed costs of the business
- interpret the reading of 2.95 on a set of scales, as appropriate to the context
- calculate the month and year that is 18 months on from a given month and year
- calculate the price of an item after a discount is applied
- estimate the flight time of a journey from a map, given the time of a shorter journey
- apply an exchange rate to convert a foreign currency amount to New Zealand currency
- calculate the earliest arrival time for goods ordered online, 6 weeks from a given time
- find a matching side view from a given top view of a sculpture
- read the total number of vehicles passing through an intersection from a composite bar graph.

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 this outcome, as stated in the standard, is to use mathematical and statistical procedures accurately in the situations.

### Markers comments (specific):

Candidates who **met this outcome** were able to:

- calculate the total amount of food consumed by an animal from a feeding diagram
- find the sum for a set of decimals presented in a table
- compare the prices for similar items offered by two different companies
- read the percentage of charge remaining from an e-vehicle vertical diagram
- calculate 60% of a distance
- establish the number of each shape required to build a pentagonal prism shaped structure
- find the number of lengths of framing timber needed to build a small pet enclosure
- image the place of connection for a given point, in the net for a cylinder
- calculate the surface area of a cuboid
- calculate the difference in vehicle numbers for two different hours, as shown on a bar graph.

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

- misread conditions that were important to the question
- calculated or reasoned incorrectly
- selected an incorrect procedure.

## Outcome 3

The requirement of this outcome, 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.

### Markers comments (specific):

Candidates who **met this outcome** were able to:

- evaluate a claim about profit and loss from a line graph
- interpret a time series graph about an animal's growth, to critique an extrapolated value
- evaluate a probabilistic claim based on a tree diagram of counts
- identify the correct bar graph for a given data set
- compare petrol, hybrid, and electric cars from a table of data
- use a given table of prices in New Zealand dollars and a foreign currency to assess a "10% cheaper" claim
- make a claim about the best outlet to purchase an item from and support the claim with evidence from the table
- use information from a bar graph to evaluate a claim about the future of online shopping
- read percentages from a pie chart to substantiate a claim
- use information from a bar chart to make a claim for, or against, a related proposal.

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

- left open response sections blank
- did not take a position about the claim
- used their personal viewpoint to assess the claim rather than use the information provided
- restated the claim without justifying their position using the information provided.

## Standard specific comments about candidates' performance

Clear patterns of strength and weakness emerged through the two assessments.
Most candidates performed well on items that involved interpretation of bar graphs and pie charts. However, candidates were less successful in using information from graphs to substantiate claims, especially with line graphs, including extrapolation of time series data.

Most candidates were generally competent in solving problems that involved addition, subtraction and multiplication of whole numbers and decimals, given the support of a calculator. They responded well to problems about purchasing goods and those involving displays of category data, such as bar and pie graphs. However, proportional reasoning in its many forms was a significant challenge for candidates, particularly working with percentages and rates, scale, and measurement conversions. Measurement of time, area and volume was also identified as needing instructional focus.

Measurement and geometry were also areas of comparative weakness. Issues included interpreting the reasonableness of a measurement expressed as a decimal, applying a scale on a map, calculating surface area, the length of framing required, folding, and imaging nets for solid shapes, and calculating with units of time (years and months). The general weakness in measurement aligns with similar findings for the Term 2 2022 Assessment.

Experience with multiple representations, including equations, tables, graphs, and diagrams, is essential to demonstrating competency within numeracy in the real world. Diagram literacy is an important aspect of Numeracy demands and warrants more teacher instruction.

Outcome 3 required candidates to present a mathematical or statistical argument. Performance of candidates was extremely variable, from strong argumentation that used evidence from the provided information to restatement of the claim with no supporting argument. There were signs of improvement in the answering of Outcome 3 questions compared to the assessment in Term 2. However, a proportion of candidates did not attempt items requiring an open response. Candidates need more opportunities to take a mathematical or statistical position and argue for that position from evidence given. This can be done by focusing on explaining strategies, and justifying positions, using evidence from calculation, data, and information. Candidates need experience with open tasks that have multiple solutions.

Overall, candidates need to be prepared before attempting the assessment.
That means three things: firstly, achieving at Level 4 of the New Zealand Curriculum as a minimum, secondly, awareness of the standardised conditions of the assessment, especially access to calculators, and finally, support with test taking techniques (e.g., using the digital platform, persistence, completing all questions, etc.).