**NZQA**

**Approved**

Achievement standard: 91264 Version 2

Standard title: Use statistical methods to make an inference

Level: 2

Credits: 4

Resource title: Staying away

Resource reference: Mathematics and Statistics VP-2.9 v2

Vocational pathway: Services Industries

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| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91264-02-8202 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

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Learner instructions

# Introduction

This assessment activity requires you to use statistical methods to make an inference about holiday accommodation in New Zealand.

You are going to be assessed on how well you integrate statistical and contextual knowledge throughout the investigation and the quality of your discussion and reasoning.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Going on holiday or taking a trip for work or recreation are just some examples of occasions when people need somewhere to stay away from home.

Use a survey to collect some data about holiday accommodation in New Zealand. Before carrying out the survey, you need to decide on suitable variables for your investigation.

Working independently, carry out a statistical investigation into accommodation occupancy in New Zealand.

## Statistical investigation process

* Pose an appropriate comparative investigative question that can be answered from data collected in your accommodation survey.
* Select random samples to use to answer your investigative question. You need to consider your sampling method and your sample size.
* Select and use appropriate displays and measures.
* Discuss sample distributions by comparing their features.
* Discuss sampling variability, including the variability of estimates.
* Make an inference.
* Conclude your investigation by answering the investigative question.

Follow this structure for your report:

* introduction – the comparative investigative question and purpose of the investigation
* method used to select samples and collect data
* results from your data, including analysis
* discussion of your findings.

The format of your report should be agreed with your assessor/educator.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to use statistical methods to make an inference, with statistical insight. They will pose a comparative investigative question based on data they collect about holiday accommodation occupancy in New Zealand, investigate the question and present a report of their findings.

# Conditions

Learners may use appropriate technology, including statistical software.

The format of the report should be agreed with your learners, it could be a computer slideshow, written report, or oral presentation.

Learners could work in groups to decide on suitable questions for the survey. They then work independently to select random samples, carry out the survey and complete their analysis and discussion.

# Resource requirements

Learners need to decide on a suitable population for the investigation and obtain a population listing (e.g. from an accommodation book or the internet).

# Additional information

The data for the investigation needs to be collected by surveying accommodation places. Before conducting the survey, decisions need to be made about the population from which to sample and possible category and numerical variables for the comparison.

Suitable categories might be:

* accommodation places in the South and North Islands
* accommodation places in two different cities or regions
* New Zealand and overseas guests
* booking systems (direct, Wotif, agency, etc)
* accommodation types (hotels, motels, etc).

Suitable numerical variables might be:

* length of stay
* number of bookings
* occupancy rate.

Assessors/educators need to ensure learners are familiar with any context specific vocabulary used in this resource.

# Assessment schedule: Mathematics and Statistics 91264 – Staying away

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner uses statistical methods to make an inference by:* showing evidence of using each component of the statistical enquiry cycle to make an inference

For example, the learner:* + specifies the purpose of the investigation or has a clear investigative question
	+ selects random samples with evidence of how this selection is made
	+ makes a selection that is sufficient and relevant to the investigative question
	+ selects and uses appropriate displays and measures
	+ discusses the sample distributions and sampling variability, including variability of estimates
	+ makes a correct inference
	+ communicates findings clearly.

For example:Problem: The question involves a comparison of two holiday accommodation groups, which identifies the population that samples are to be taken from.Plan and data: An appropriate random sample is generated from each holiday accommodation group and the corresponding population data collected. The sampling method is named and sample size stated.Analysis: Summary statistics are calculated (or implied by the box plot) for each holiday accommodation group and there is a dot plot and box and whisker graph for each set of sample data. The informal confidence intervals for the population medians are found (or implied by being shown on the box plot).The distributions are discussed in context and at least two comparative features of the sample distributions (shape, overlap, shift, spread, middle 50%, unusual or interesting features) are identified.Conclusion: An answer is given to the investigative question that is consistent with the analysis and references the population. (The answer may be part of the inference.) Sampling variability is discussed and the fact that different samples will give different intervals or estimates of population parameters is indicated. An inference (may be part of the analysis) is made using the informal confidence intervals (e.g. the learner states they are pretty sure a population median will lie within a correctly calculated interval).*The examples above are indicative of the evidence that is required.* | The learner uses statistical methods to make an inference, with justification, by:* linking components of the statistical enquiry cycle to the context and/or populations, and referring to evidence in support of statements made

For example, the learner:* + specifies the purpose of the investigation or has a clear investigative question
	+ links the purpose or question to the situation being investigated
	+ selects random samples and the selection is sufficient and relevant to the investigative question
	+ refers to decisions about method or sample size
	+ selects and uses appropriate displays and measures
	+ discusses the sample distributions, using supporting evidence that is linked to the context
	+ discusses sampling variability, including variability of estimates
	+ makes a correct supported inference
	+ communicates findings clearly, and links findings to the context and populations.

For example:Problem: The question involves a comparison of two holiday accommodation groups, which accurately describes the population that samples are to be taken from. The holiday accommodation groups are clearly defined.Plan and data: An appropriate random sample is generated from each holiday accommodation group and the corresponding population data collected. Contextual reasons are given for the use of a simple random sample or sample size.Analysis: Summary statistics are calculated (or implied by the box plot) for each holiday accommodation group and there is a dot plot and box and whisker graph for each set of sample data. The informal confidence intervals for the population medians are calculated and plotted. Distributions are discussed in context. At least two comparative features of the sample distributions are identified and comments linked to the investigative question and population. An inference is made using the informal confidence intervals (e.g. the learner states they are pretty sure the population medians will lie within a correctly calculated interval).Conclusion: A conclusion about the population medians is made and justified using the informal confidence intervals. Justification comments are in context and include an interpretation of the informal confidence intervals. There is an answer to the investigative question with contextual comments supported by references to specific evidence from the analysis (e.g. overlap of intervals). (The answer may be part of the inference.) Sampling variability is discussed, and the fact that different samples will give different intervals or estimates of population parameters is indicated. The effect of at least one aspect (e.g. sample size) is considered. Comments are made in context, related to the interval (e.g. that such an interval would contain the population median in most cases). An understanding of the difference between the sample calculations and population estimates is demonstrated.*The examples above are indicative of the evidence that is required.* | The learner uses statistical methods to make an inference, with statistical insight, by:* integrating statistical and contextual knowledge throughout the statistical enquiry cycle which may involve reflecting on the process or considering other explanations

For example, the learner:* + specifies the purpose of the investigation and investigative question, and these are relevant to the situation being investigated
	+ selects random samples and the selection is sufficient and relevant to the investigative question
	+ refers to decisions about method and sample size
	+ selects and uses appropriate displays and measures
	+ discusses the sample distributions, integrating statistical and contextual knowledge
	+ discusses sampling variability, including variability of estimates
	+ makes a correct supported inference
	+ communicates findings clearly and links findings to the context and populations
	+ justifies their inference, integrating contextual and statistical knowledge, or reflects about the process, or considers other explanations.

For example:Problem: The question involves a comparison of two holiday accommodation groups, which accurately describes the population that samples are to be taken from. The holiday accommodation groups are clearly defined. There is contextual reflection or explanations relating to aspects of the question.Plan and data: An appropriate random sample from each holiday accommodation group is generated and corresponding population data collected. Contextual reasons are given for deciding on the use of a simple random sample and the sample size.Analysis: Summary statistics are calculated (or implied by the box plot) for each holiday accommodation group and there is a dot plot and box and whisker graph for each set of sample data. Informal confidence intervals for the population medians are calculated and plotted. Distributions are discussed in context. At least three comparative features of the sample distributions are identified and contextual knowledge is used to link comments to the investigative question and population.Conclusion: A conclusion about the population medians is made and justified using the informal confidence intervals. There is an answer to the investigative question, with contextual comments supported by references to specific evidence from the analysis (e.g. overlap of intervals). An understanding of the difference between sample calculations and population estimates is demonstrated. The learner reflects on the process or gives explanations by considering, in context, the effect of aspects such as sample size on the estimate. Aspects of the investigation are discussed in context, such as a limiting factor in the definition of the holiday accommodation groups, and identifying their impact on the reliability of estimates. Sampling variability is discussed and the fact that different samples will give different intervals or estimates of population parameters is indicated. The effect of at least one aspect (e.g. sample size) is considered. Comments are made in context, related to the interval (e.g. that such an interval would capture the population median most of the time).*The examples above are indicative of the evidence that is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.