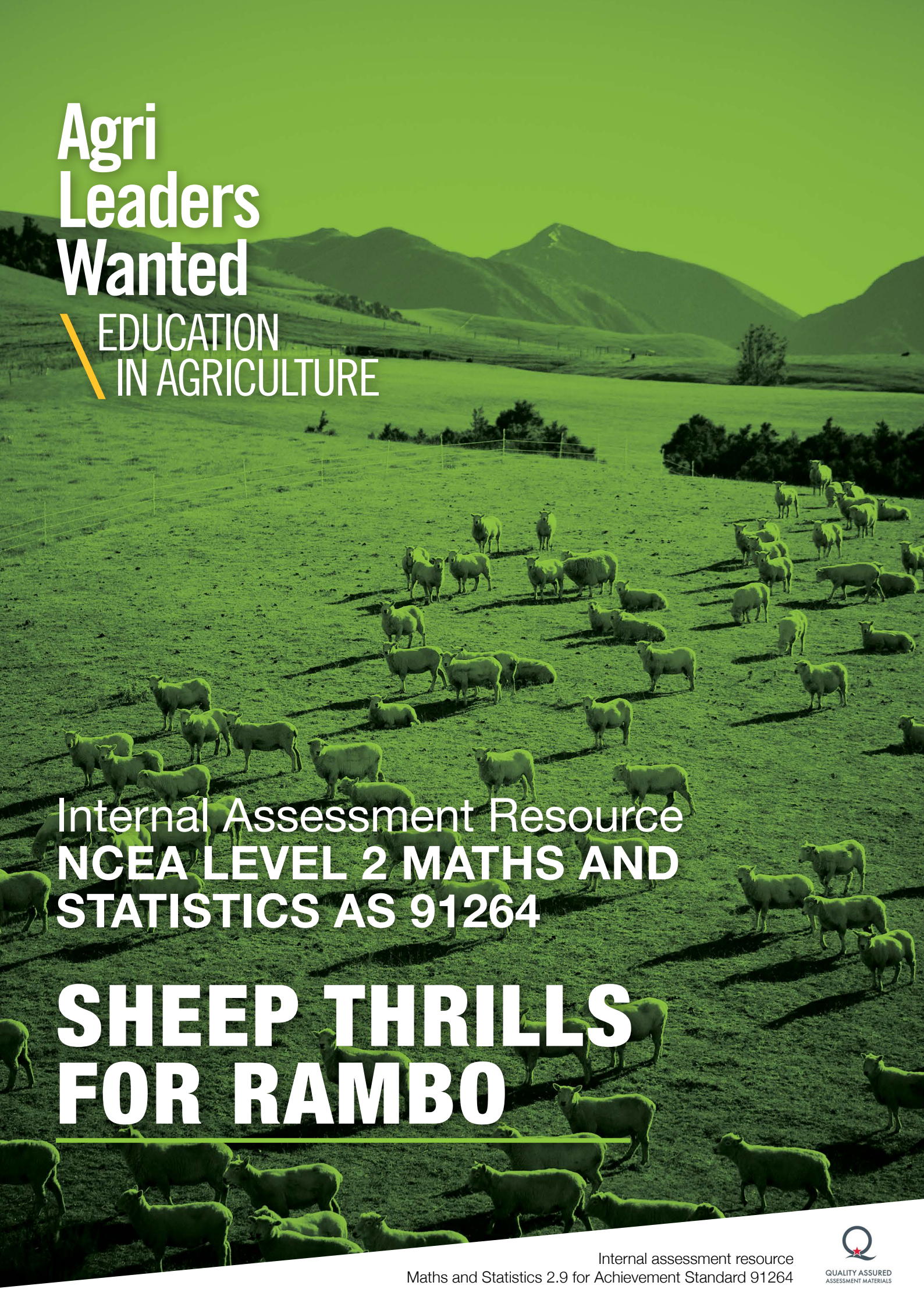

Agri Leaders Wanted

EDUCATION IN AGRICULTURE

Internal Assessment Resource

NCEA LEVEL 2 MATHS AND STATISTICS AS 91264

SHEEP THRILLS FOR RAMBO

Internal assessment resource
Maths and Statistics 2.9 for Achievement Standard 91264

QUALITY ASSURED
ASSESSMENT MATERIALS

Contents

This resource has been funded by the Red Meat Profit Partnership, in conjunction with NZ Young Farmers and CORE Education.

Overview

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This resource supports assessment against Achievement Standard **91264 version 3**

Standard title:	Use statistical methods to make an inference
Credits:	4
Resource title:	Sheep thrills for Rambo

This resource:

- Clarifies the requirements of the standard
- Supports good assessment practice
- Should be subjected to the school's usual assessment quality assurance process
- Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic.

Authenticity of evidence

Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.

Using this assessment resource without modification may mean that students' work is not authentic. The teacher 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.

Achievement standard: 91264
Standard title: Use statistical methods to make an inference
Credits: 4
Resource title: Sheep thrills for Rambo

Teacher guidelines

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

Teachers 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 students against it.

Context/setting

This activity requires students to carry out a comparative statistical investigation using the data from the Sheep Growth dataset, and prepare a report. It requires students to pose a comparative question based on the Sheep Growth dataset (CSV file).

Conditions

This assessment activity requires multiple sessions. Confirm the timeframe with your students. Students must work independently.

Before they begin, students should have ample opportunities within the teaching and learning programme to become familiar with, and to use, all components of the statistical enquiry cycle. They should also be given time to become familiar with manipulation of Excel spreadsheets and CSV files.

Also, students should be given prior opportunities to become familiar with and understand the meaning of the different variables in this quite complex dataset. While they are not being assessed on their agricultural knowledge, they need to understand the agricultural context (including the meaning of all the variables) before they can proceed with their investigation.

For the purposes of their investigation, students need to consider the dataset provided as the population. Data values have been edited to ensure that students can make meaningful comparisons between variables and complete an investigation that produces accessible and meaningful results.

The students choose which variable they will investigate and identify which groups they will use. Different students can choose different variables and select different groups. Teachers should check that the variables and groups they select will give them sufficient data to allow for a meaningful investigation.

This activity requires a comparison based on a single variable, so students need to identify two groups with a common variable. A bivariate (relationship) analysis is not appropriate. Teachers should therefore check each student's question to ensure that it can be investigated via a univariate analysis.

Resource requirements

Students will need:

- The Sheep Growth dataset (CSV file). (The dataset is supplied by B+LNZ Genetics and comes from the Sheep Improvement Ltd database used by NZ ram breeders.)
- Resource A – A Quick Guide to Sheep Growth Dataset Column Headers.
- A level 2 mathematics formula sheet.
- Access to technology that will enable them to manipulate an Excel spreadsheet (for example, to isolate a variable or select a random sample) and create graphs and prepare summary statistics (Inzight or Inzight lite are useful for these latter purposes).

Additional information

Teachers should be familiar with the material in the Informal Inference section of the CensusAtSchool website.

Achievement standard: 91264
Standard title: Use statistical methods to make an inference
Credits: 4
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Student instructions

Introduction

This assessment activity requires you to carry out a comparative statistical investigation using the data from the Sheep Growth dataset and prepare a report.

You are going to be assessed on the quality of your discussion and reasoning and how well you link the context to the different stages of the statistical enquiry cycle.

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

Task

Carry out a comparative statistical investigation using the data from the Sheep Growth dataset and prepare a report. Your investigation must cover all components of the statistical enquiry cycle.

You must work independently.

The Sheep Growth dataset, which you will be given, contains birth data from two large flocks of sheep. The flocks are located in hill country in the North Island and the sheep breed is Romney. The sheep in 'Flock 751' and 'Flock 1539' gave birth to 970 lambs over the year 2014. For each lamb, the body weight at weaning (WWT) is given; most have a second weight (LW8), taken at 8 months. The identity of the dam (mother) and sire (father), the number of lambs per birth, gender of lamb, date of birth and age of dam are also recorded in the dataset. The data also includes records on dead lambs (Indicated with a Lamb tag ID of "DL00…").

The dataset is presented in CSV format.

For your investigation, you should consider the dataset provided as the population. Choose which variable you will investigate and identify which groups you will use.

You need to:

- make meaningful comparisons between variables
- complete an investigation that produces accessible and meaningful results.

Statistical investigation process

Pose an appropriate comparative investigative question that can be answered using the data provided in the Sheep Growth dataset.

Record what you think the answer to your question may be.

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 a supported inference.

Conclude your investigation by answering your investigative question.

Justify your inference by integrating contextual and statistical knowledge, or reflect about the process, or consider other explanations.

Report structure

Structure your statistical investigation into a report that includes:

- an **introduction** stating your comparative investigative question, the purpose of your investigation, and what you predict the result will be
- the **method** you used to select samples, clean, and collect data
- your **analysis** of the data and **results**
- a **discussion** of your findings and your **conclusion**.

You need to show evidence of using each component of the statistical enquiry cycle to make an inference.

The quality of your discussion and reasoning and how well you link the context to the different stages of the statistical enquiry cycle will determine your overall grade.

Submit for assessment

When you are satisfied with your report, hand it in for assessment.

Resources

- The Sheep Growth dataset (CSV file). (The dataset is supplied by B+LNZ Genetics and comes from the Sheep Improvement Ltd database used by NZ ram breeders.)
- A level 2 mathematics formula sheet.
- Resource A – A Quick Guide to Sheep Growth Dataset Column Headers.

Resource A

A quick guide to sheep growth dataset column headers

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Column	Abbreviation		
A	SFlk	Birth flock of sire of lamb	Together with the next trait these uniquely identify sire of the lamb
B	Sire	Sire tag ID	see above
C	DBFlk	Birth flock of dam of lamb	Together with the next trait these uniquely identify dam of the lamb
D	Dam BTag	Birth tag of dam	see above
E	Dam NLB History	A string of digits detailing how many lambs a ewe had each year	Shorthand for lambing performance of a ewe. Digits are litter size each year from 1 year old onward. A "." signifies unknown value or not mated. A zero signifies she was mated but had no lambs.
F	BFlk	Birth flock of lamb born in 2014	Together with the next trait these uniquely identify the lamb
G	Lamb Tag number	Birth tag of lamb born in 2015	see above note codes with DL indicate Dead Lamb
H	AoD	Age of dam	Used to adjust for differences in performance of lambs born to young mothers
I	Birth Date	Date of birth of lamb	Used to adjust for effect of age on performance measured at a fixed time
J	Sex	Sex of lamb	Used to adjust for differences in performance between males and females
K	Birth rank	Litter size the lamb was born in	Used to adjust for differences in performance of singles, twins and triplets
L	Rear Rank	How many of the litter survived to weaning	As above
M	SORT Birth Year	Birth year of lamb	Used for sorting animals
N	SORT Num BTag	Numeric part of birth tag of lamb	Used for sorting animals
O	WWT	Body weight of lamb at weaning	A measure of growth - partly due to lamb partly due to dam through milk
P	LW8	Body weight of lamb in the autumn (c.8 months of age)	A measure of growth after weaning when mother does not supply milk
Q	FW12	Fleece (wool) weight at 1 year of age	Wool growth in first year of life - a measure of wool production
R	WWT mob	Management mob lamb was in up till weaning	Used to adjust for differences between mobs due to being run in different paddocks up to weaning

Assessment schedule

Mathematics and Statistics 91264 – Sheep thrills for Rambo

QUALITY ASSURED
ASSESSMENT MATERIALS

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
Use statistical methods to make an inference.	Use statistical methods to make an inference, with justification.	Use statistical methods to make an inference, with statistical insight.
The student shows evidence of using **each** component of the statistical enquiry cycle to make an inference.	The student makes an inference, showing evidence of linking each component of the statistical enquiry cycle to the **context, and/or populations** and referring to **evidence in support** of statements made.	The student makes an inference, showing evidence of **statistical insight**, which involves integrating contextual and statistical knowledge throughout the statistical enquiry cycle, or reflecting about the process, or considering other explanations.
To achieve this standard a student must cover all components of the statistical enquiry cycle (PPDAC). **In the schedule below each bullet point corresponds to a component of the statistical enquiry cycle. However, separate paragraphs do not need to be written for each point. Ideas often overlap, so different aspects may be covered in a single paragraph.**		
The student has: • specified the purpose of the investigation or has a clear investigative question • selected random samples with evidence of how this selection was made. The selection is sufficient and relevant to the investigative question • selected and used appropriate displays and measures • discussed the sample distributions • discussed sampling variability, including variability of estimates • made a correct inference	**The student has:** • specified the purpose of the investigation or has a clear investigative question. The purpose or question link to the situation being investigated • selected random samples. The selection is sufficient and relevant to the investigative question. Reference to decisions about method or sample size is made • selected and used appropriate displays and measures • discussed the sample distributions, using supporting evidence that is	**The student has:** • specified the purpose of the investigation and the investigative question, and these are relevant to the situation being investigated • selected random samples. The selection is sufficient and relevant to the investigative question. Reference to decisions about method and sample size is made • selected and used appropriate displays and measures • discussed the sample distributions, integrating statistical and contextual knowledge

• communicated findings clearly. **For example:** **Problem** *The question is a comparative one between two groups and identifies the population/ parameter from which samples are to be taken.* **Plan and data** *An appropriate random sample from each group has been generated and the corresponding population data collected.* *The sampling method is named and sample size stated.* **Analysis** *Summary statistics have been calculated (or implied by the box plot) for each 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 have been found (or implied by being shown on the box plot).* *The distributions are discussed in context – at least two comparative features of the sample distributions (shape, overlap, shift, spread, middle 50%, unusual or interesting features) have been identified.* **Conclusion** *The conclusion includes an answer to the investigative question that is consistent with the analysis and references the population. (The answer to the investigative question may be part of the inference.)*	linked to the context • discussed sampling variability, including variability of estimates • made a correct supported inference • communicated findings clearly, and has linked findings to the context and populations. **For example:** **Problem** *The question is a comparative one between two groups and accurately describes the population/parameter from which samples are to be taken. The groups are clearly defined.* **Plan and data** *An appropriate random sample from each group has been generated and the corresponding population data collected. Contextual reasons have been given for deciding on the use of a simple random sample or the sample size.* **Analysis** *Summary statistics have been calculated (or implied by the box plot) for each 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 have been calculated and plotted.* *The distributions are discussed in context - At least two comparative features of the sample distributions have been identified and comments have been linked to the investigative question and the population.* *An inference is made using the informal confidence*	• discussed sampling variability, including variability of estimates • made a correct supported inference • communicated findings clearly and has linked findings to the context and populations. They have justified their inference, integrating contextual and statistical knowledge, or they have reflected about the process, or they have considered other explanations. **For example:** **Problem** *The question is a comparative one between two groups and accurately describes the population/parameter from which samples are to be taken. The 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 group has been generated and the corresponding population data collected. Contextual reasons have been given for deciding on the use of a simple random sample and the sample size.* **Analysis** *Summary statistics have been calculated (or implied by the box plot) for each 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 have been calculated and plotted.* *The distributions are discussed in context - at least three comparative features of the sample distributions have*

Sampling variability has been discussed - the fact that different samples will give different intervals or estimates of population parameters has been indicated. *An inference (may be part of the analysis) is made using the informal confidence intervals, for example the student has stated they are pretty sure a population median will lie within a correctly calculated interval.* The examples above are indicative samples only.	*intervals, for example the student has stated they are pretty sure the population medians will lie within a correctly calculated interval.* **Conclusion** *A conclusion about the population medians has been 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 that are supported by references to specific evidence from the analysis, for example, overlap of intervals. (The answer to the investigative question may be part of the inference.)* *Sampling variability has been discussed - the fact that different samples will give different intervals or estimates of population parameters has been indicated. The effect of at least one aspect, for example, sample size, has been considered. Comments, in context, related to the interval have been made, for example, that such an interval would contain the population median in most cases.* *An understanding of the difference between the sample calculations and population estimates has been demonstrated.* The examples above are indicative samples only.	*been identified and contextual knowledge has been used to link comments to the investigative question and the population.* **Conclusion** *A conclusion about the population medians has been made and justified using the informal confidence intervals. There is an answer to the investigative question with contextual comments that are supported by references to specific evidence from the analysis, for example, overlap of intervals. An understanding of the difference between the sample calculations and population estimates is demonstrated. The student has reflected on the process or has given explanations by considering, in context, the effect of aspects such as sample size on the estimate. They have discussed aspects of the investigation in context, such as a limiting factor in the definition of the groups, and have identified their impact on the reliability of estimates.* *Sampling variability has been discussed - the fact that different samples will give different intervals or estimates of population parameters has been indicated. The effect of at least one aspect, for example, sample size, has been considered. Comments, in context, related to the interval have been made, for example, that such an interval would capture the population median most of the time.* The examples above are indicative samples only.

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.