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91584



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!



SUPERVISOR'S USE ONLY

Level 3 Mathematics and Statistics (Statistics), 2016

91584 Evaluate statistically based reports

2.00 p.m. Thursday 24 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Evaluate statistically based reports.	Evaluate statistically based reports, with justification.	Evaluate statistically based reports, with statistical insight.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Pull out Resource Booklet 91584R from the centre of this booklet.

Show ALL working.

Make sure that you have the Formulae and Tables Booklet L3–STATF.

If you need more room for any answer, use the space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL

10

ASSESSOR'S USE ONLY

QUESTION ONE

Refer to **Report 1** in the resource booklet to answer the following questions.

- (a) Identify and describe the explanatory and response variables for the study.

response = increase in healthy food purchased
explanatory = reduce price of healthy food

- (b) The report claims that “price discounts are more effective than nutrition education in encouraging people to buy healthier foods”.

Explain whether this study is an observational study or an experiment, and the implications of this for this claim.

This study is an experiment because it is completed and taken out/executed by those who are also writing the study. Due to the fact that this is an experiment it must be analysed how they completed it to find results as biases may be present or incorrect methods used resulting in inaccurate data to base their conclusions off.

- (c) Explain why random allocation was used to form the two groups compared in the study.

As part of your explanation, give specific examples related to the study discussed.

Random allocation was used to form the two groups in the study to avoid a bias, by randomly allocating and avoiding the bias the data will be more accurate, for example if they didn't randomly allocate the groups but did it by the suburb a shopper lived in and those in poorer areas received the price discount, it wouldn't be accurate because already being able to buy more food for cheaper will entice them to buy healthy food.

- (d) A potential issue with a statistical study is extending the results inappropriately.

Discuss ONE potential issue with extending the results of this study.

An issue is that it may not reflect the population, they haven't disclosed who was in the sample or what population it reflected therefore by claiming that the whole of NZ must reduce prices on healthy goods is a tall order to ask, because it may not be necessary as this sample could have easily been composed of people who do not understand how to eat healthily and this increase in weight of healthy food bought might be up to a normal level of healthy food.

QUESTION TWO

Refer to **Reports 2a** and **2b** in the resource booklet to answer the following questions.

Report 2a is a media report that was based on the information provided in Report 2b.

- (a) The reported margin of error is 1.7%.
 (i) Show how this margin of error was calculated.

$$\frac{1}{\sqrt{3451}} = 0.017 = 1.7\%$$

- (ii) Explain why the margin of error should be included in statistical survey reports.

The margin of error should be included because it counters for the sampling variability.

- (b) The media report states that 59% of the survey respondents definitely or possibly favoured a reduction in the serving sizes of sugar drinks.

Construct a confidence interval using this percentage, and interpret this confidence interval.

$$57.3\% - 59\% - 60.7\%$$

We can say with 95% confidence that back in the population of Kiwi adults that somewhere between 57.3% and 60.7% resides the true percentage of those who definitely or possibly favour a reduction in the serving sizes of sugar drinks.

- (c) Discuss ONE potential issue with the design of the survey and/or questions.

A potential issue with the questions that could arise is a question bias. Especially with this population of Kiwi adults who generally have children these people want to look out for the health of their children. By consuming sugar it puts them at health risks, especially if they consume a lot. Therefore by asking them this they'll become protective and want to make sure there is very little sugar in drinks leading to potentially inaccurate results.

- (d) The first paragraph of Report 2a is based on information and results from Report 2b, specifically the survey percentages for the first sugar consumption question headed "Limit sugar in drinks".

Discuss the quality of this paragraph.

By showing the candidate before the interviewing process information showing that NZ consumes 32 teaspoons of sugar a day, 27 higher than the WHO recommends creates an interviewer bias as this will most definitely affect the results of what they decide on the questions because it is sensitive information that will swing them towards implementing the sugar tax, resulting in inaccurate results.

QUESTION THREE

Refer to **Report 3** in the resource booklet to answer the following questions.

- (a) The report states the margins of error for the 2006 and 2008 surveys were 3.8% and 4.5% respectively.

Explain why the reported margins of error are different for the two surveys.

A higher margin of error in 2008 is a result of making the sample size surveyed smaller.

- (b) A reader of this report has made the following statement to a friend: "A higher proportion of males in the 2008 survey parked in disability parks without a permit than females".

Evaluate what statistical evidence, if any, has been presented in the report to support this statement.

The evidence that is provided to back the claim that men abused disability parks more is that 59% surveyed were male who broke the rules. If a confidence interval were to be drawn, $54.5\% - 59\% - 63.5\%$. This shows that even at its lowest it is still above 50% therefore males are the majority, and it is a fair statement to make.

- (c) Assume that the samples of cars/people obtained in 2006 and 2008 are representative of all cars/people in New Zealand in those years.

Can a claim be made that the percentage of New Zealand cars/people who used a disability park without displaying a current permit was lower in 2008 compared to 2006?

Construct ONE confidence interval, and interpret this interval as part of your answer.

$$3.8 + 4.5 = 8.3$$

$$8.3/2 = 4.15\%$$

$$4.15 + 1.5 = 6.225\%$$

$$2008 : 27.775\% - 34\% - 40.225\%$$

$$2006 : 33.775\% - 40\% - 46.225\%$$

Due to this confidence interval there is an overlap present therefore showing that the claim a drop in disability parking without a permit is incorrect.

- (d) The heading for this report is "Higher fines discourage disability parking abuse".

Discuss ONE potential issue with the study design used for the 2008 survey, in respect to the heading for this report.

The issue is that firstly a drop in the parking abuse was "measurable" but it was still too high due to Mr Wilson. Therefore there has been an incorrect transfer of findings and the title does not reflect the content of the study.

Achieved exemplar 2016

Subject:		Mathematics	Standard:		91584	Total score:		10
Q	Grade score	Annotation						
1	A3	<p>1(a) Explanatory variable incomplete – price discount AND receive nutrition education required</p> <p>1(b) Experiment identified with no supporting evidence to why it is an experiment</p> <p>1(c) Explains why random allocation is a good design feature with an example that is general and not about the two groups formed, only one – discount. Does not link to reducing bias or creating two fair groups.</p> <p>1(d) Identified that it may not reflect the population but does not link to regional/national to extend the results of the study.</p>						
2	A4	<p>2(c) No issue identified to the survey design or questions</p> <p>2(d) Does not link the two % values identified to 77.2% in 1st paragraph to the table</p>						
3	A3	<p>3(a) Identifies MOE linked to sample size AND $n_{2008} < n_{2006}$ implied</p> <p>3(b) Has not identified that there is an issue with proportions vs counts</p> <p>3(d) Does not identify this as an observational study hence a causal claim cannot be made. Does not identify the change is implied to all disabled parking spaces hence selection bias.</p>						