Assessment Schedule 2019

Mathematics and Statistics (Statistics): Evaluate statistically based reports (91584)

Evidence Statement

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
ONE (a)	Explanatory variable: Building of cycle and walking paths. Response variable: Vehicle kilometres travelled and / or carbon emissions.	Explanatory AND response variable are described.		
(b)	Taking two measurements of vehicle kilometres travelled from each town allows the researchers to calculate the change in levels for each town between the two conditions (cycleways versus no cycleways). Each town then acts as their own control (baseline), because each town would have a pre-existing level of vehicle kilometres travelled (and this design feature minimises variation).	Difference Identified over time (before and after).	**Explanation** about need to measure the change in vehicle kilometres travelled for each town, since each town is different in terms of previous levels of these two variables.	
(c)(i)	The researchers needed to use a variety of methods to collect information on car usage because each of the methods used leads to incomplete data. • Not every individual can be interviewed face-to-face. • Odometer readings from licensing data omits information from those cars that aren't licenced. • Not every individual completes the NZ Household Travel Survey. Using a combination of these methods should give a better estimate of the true vehicle kilometres travelled.	Identifies that each method used to collect information will lead to missing data (or more data). AND List at least two methods.	Identifies and **describes** how at least one method is used to collect information will lead to missing data (or more data).	Identifies and describes at least one method used to collect information will lead to missing data (or more data) and discusses combination and effect on population.
(ii)	The results regarding carbon emissions have been extended nationwide. This is a potential issue as the way people use cars in smaller towns (such as New Plymouth and Hastings) is not the same as in larger cities (such as Auckland). The estimate of the nationwide reduction in carbon emissions is likely to be incorrect.		describes how extending the carbon emissions results nationwide will lead to an incorrect estimate. OR Discussion of extending emissions / km travelled / car usage to other regions.	

(d)	This is an observational study. As the researchers were not in control of the treatment levels (with cycleways, without cycleways), they cannot make a causal claim. The researchers are using Whanganui and Masterton as a 'control' to compare the change in transport habits with New Plymouth and Hastings since the extra cycle / walkways were constructed. Presumably those towns were selected for being similar demographically, and in size (all relatively small), climate, and topography. The researchers would be able to compare the change in transport habits in Whanganui and Masterton with the change in transport habits in New Plymouth and Hastings to determine whether the level of improvement observed was due to the improved infrastructure, or due to chance alone. Students may identify that the population differences suggest the two sets of cities/towns are in fact not similar.	Identifies that the study is observational or mentions a causal claim cannot be made.	Describes that the two towns being used as a comparison allow the researchers to reach a conclusion based on the differences found from New Plymouth and Hastings.	Explains the similarity of other towns without the infrastructure, and how the researchers would need to compare these "similar" towns to New Plymouth and Hastings to act as a base to measure the level of improvement.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Attempt at one part of the question.	1 of c	2 of c Or 1 j	3 of c Or 1 j and 1 c	2 of j	3 of j	1 of i	2 of i

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
TWO (a)	$\text{MOE} = \frac{1}{\sqrt{n}} = \frac{1}{\sqrt{937}} = 0.033$ or approximately 3.3% MOEs are needed to take into account the natural **variation** that always occurs from sample to sample.	Correct calculation of MOE. AND Explains why the MOE is required.		
(b)	By using a mixture of survey methods, the council was considering methods that best represented its community, and to boost sample size from the survey. For example, older shoppers and those who live in more rural areas may be more likely to complete a paper-based form. Younger shoppers and those who live in more urban areas are probably more capable of completing an online survey. Care would need to be taken over receiving duplicate surveys.	Shows that the survey method used will increase sample size OR improve representation.	Shows that the survey method used will increase sample size or improve representation. AND EITHER Describes at least one issue with example that needs to be taken into consideration with this choice of survey method. OR Critiques the survey method with regard to the purpose of the study. (i.e. duplicate surveys)	Shows that the survey method used will increase sample size or improve representation. AND Describes at least one issue that needs to be taken into consideration with this choice of survey method. AND Critiques the survey method with regard to the purpose of the study. (i.e. duplicate surveys)
(c)	Comparison of two subgroups within one survey: MOE = 3.3% MOE × 2 = 6.6% Difference between 'occasionally' and 'regularly' use plastic bags = 47.9% – 35.1% = 12.8% Thus confidence interval would be [6.2%, 19.4%]. I am pretty sure that the percentage of Marlborough shoppers who occasionally use plastic bags is between 6.2% and 19.4% higher than those who regularly do. As zero is not in this confidence interval, it can be claimed that the percentage of Marlborough shoppers who use plastic bags only occasionally is higher than the percentage of shoppers who regularly do. Claim is supported.	MOE × 2 and difference between occasional and regularly correctly calculated. OR Or student has correctly calculated an incorrect CI and both Interpretation and Claim is in context.	Confidence interval correct . AND EITHER Interpret in context. OR A response to the claim made by the council is stated using the context of plastic bag surveys.	Confidence interval correct . AND Interpret in context. AND A response to the claim made by the council is stated using the context of plastic bag surveys.

(d)	The percentage of shoppers in the waste management company's survey who supported any of the possible views on a charge for plastic bags were all below 30%: Strongly against 22%, slightly against 18%, neither for nor against 21%, slightly in favour 19% and strongly in favour 21%. The rule of thumb MOE will overestimate the size of the MOE. Hence the reported margin of error should be used as only an estimate of the margin of error with survey percentages between approximately 30% and 70%.	Identifies that any one (or all) of the survey percentages is/are outside the range of 30% to 70% (less than 30%).	Identifies any one of the reported percentages is less than 30% (must state survey percentage) and explains that the rule of thumb MOE will **overestimate** the size of the MOE or write the extended formula as the choice to use.	

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No response; no relevant evidence.	Attempt at one part of the question.	1 of c	2 of c or 1j	3 of c or 1j and 1c	2 of j	3 of j	1 of i	2 of i

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
THREE (a)	Control group = no omega 3 use Treatment group = omega 3 use Must be described with reference to omega 3 use.	The control group. AND the treatment group are described.		
(b)	Students should be randomly allocated into the omega 3 use and non omega 3 use groups to attempt to create two unbiased (fair or balanced) groups or **reduce** bias in groups for comparison.	Comments on the use of random allocation as a good design feature of an experiment.	Explains how random allocation is used to reduce bias or to create two fair or balanced groups, since not all factors that could affect writing and general focus in children could be controlled.	
(c)	Issues could include: • The assurance of each participant taking the omega 3 tablets as prescribed, e.g. students may be absent from school and miss their tablets. Issue with isolating effect of treatment variable. • How the testing of 'general focus' was done – no details are given on how 'general focus' is described or measured. Issue with measuring response variable. • There was no placebo used for the control group, and the students (and teacher / principal) knew that they were in an experiment. Issue with study not being blinded. NOTE: Discussion at all levels has to be focused on claim made, not general discussion of study design features.	Identify 1 relevant issue with the study design: • test focus • placebo • assurance that students taking pills.	One relevant issue with study design **described** in terms of how it weakens the causal claim.	One relevant issue with study design fully described in terms of how it weakens the causal claim, with clear links to context including quotes / references from the report or other relevant evidence.
(d)	The natural health products company wants to ensure more of their product is sold in order to make a profit. Given the results stated after one month of the trial (i.e. improved writing and general focus), the company may be more inclined to supply the product that is generating these results. If the school wishes to pursue this experiment, it is in their interests to show an improvement amongst the students' attainment at school. AND / OR The company may alter, or exclude some information that doesn't show the product in a positive light .	Identifies that the company that supplied the funding of the study is provided by a natural health products company (e.g. Natural Health, or Omega 3 or North Shore Company). AND Describes who they want positive results.	Explains why the findings of the survey could be used to the company's advantage with reference to the survey results reported. AND Describes how the issue impacts the study.	

(e)	Issues include: • Study involved just one school in one location (North Shore). The students who are at this school may have different characteristics in terms of academic progress than students at other schools. For example differences in health/teaching quality. • Some students (e.g. those deficient in omega 3) may respond differently. • Only children aged 11 to 13 took part in the study; these children may have different characteristics to all children of school age. Don't accept "small sample size" discussions.		Describes one potential issue with extending the results. AND **Attempts** to explain why it could limit extending the results.	Describes <u>two</u> potential issues with extending the results. AND <u>Discusses</u> how at least one **<u>potential</u>** issue could limit extending the results by using specific features of the report / study.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 12	13 – 18	19 – 24