Assessment Schedule 2021

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

Evidence Statement

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
ONE (a)(i)	Using rule of thumb: Margin of error is $\dfrac{1}{\sqrt{883}} = 0.0337 = 3.37\%$	• Correct margin of error AND	• Correct margin of error AND	
(ii)	The margin of error is needed to take into account the natural variation we would expect to see from survey to survey just through the process of sampling. For the Federated Farmers Rural Connectivity Survey 2020, every time a sample of farmers are surveyed and asked the questions on connectivity, we would expect slightly different results.	Provides a generic template answer about the natural variation expected due to sampling.	• Describes how the margin of error is required in the Federated Farmers connectivity context.	
(b)	The percentage of farmers with slow internet connections in the population of ALL FARMERS in NEW ZEALAND will most likely be **more** than that reported in the survey results, due to these farmers not being able to complete the online survey.	• Identifies that results will be different from reported percentages *(general statement)*.	• Identifies that results will be **more** than the reported percentages for slow internet connections *(specific statement)*.	• Identifies that the **population** (all NZ farmers) percentage for slow internet connections will be **more** than that reported with reason why *(specific statement including population and reason)*.
(c)	The target population is all farmers in New Zealand. The sampling frame is those farmers who are members of Federated Farmers. There are issues with whether this sampling process would produce a representative sample. The survey was done online (self-selection bias, safeguards against repeat submissions(?)), and is predominantly only available to farmers who are members of Federated Farmers and see the publicity about the survey. This is not necessarily representative of all farmers in New Zealand. Crucially, there is evidence that the selection of those who took part in the survey was not random.	• Correctly identifies target population and / or sampling frame.	• Explanation given regarding the likely representativeness of the sample.	• Merit AND Discussion of non-random selection of the sample with specific evidence of a non-sampling error, e.g. response rate.

| (d) | Margin of error is $\dfrac{1}{\sqrt{883}} = 0.0337 = 3.4\%$

 CI: 68% ± 3.4% [64.6%, 71.4%]

 I'm pretty sure that the percentage of New Zealand farmers who, at the time of the survey, had an average download speed between 0–20 Mbps is somewhere between 64.6% and 71.4%. | • Confidence interval correctly calculated. | • Confidence interval correctly calculated AND used to write inference statement in context (with target population AND variable). | |

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 of j	3 of c	1 of j AND 1 of c	2 of j	1 of i	2 of i

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
TWO (a)	The experiment is looking at the influence of a robot encouraging the participant to keep inflating the balloon. By having the robot control condition, they can tell whether just the robot's presence makes any difference to the participant's risk-taking / balloon-inflating behaviour.		• Identifies the need to know if the robot on its own will have an influence on the participant's behaviour.	
(b)	The explanatory variable is the external influence while doing the task, e.g. nothing, robot giving only instructions, or robot giving encouragement. The response variable is the total number of explosions. *Accept total earnings, do not accept MEDIAN total number of explosions.*	• Explanatory AND response variable are described.		
(c)	The researchers could have found the difference between the median of the treatment group's number of explosions (11 explosions), and the median of the robot control group's number of explosions (8 explosions). The participants were randomly allocated to the three conditions; therefore a causal conclusion that the difference between the two medians (difference = 3 explosions) is significant can be made.	• Identifies need to find the difference of two medians between treatment and robot control groups.	• Makes statement comparing differences (including values from the graph) of medians between treatment and robot control group.	• Merit AND • Discussion of need for random allocation to make a causal conclusion.
(d)	Each of the three groups (control, robot control, and treatment) contains one third of the participants of each gender. This allows the researcher to control for any differences in response due to gender. By splitting the groups in this way, any differences seen in the results for the three groups can be said to be caused by the different conditions (control, robot control, and treatment) rather than being due to differences in response by participants of either gender.	• Identifies that each of the three groups contains one third of the participants of each gender. (Accept "Groups of 60" or similar wording. Simply saying "even groups" not acceptable.)	• Achievement. AND Describes how this controls for the effect of gender.	• Merit AND Discusses how any differences seen in the results for the three groups can be said to be caused by the different treatments rather than being due to differences in response by participants of either gender.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
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Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
THREE (a)	About 70% of children under the age of five who were part of the research used some te reo Māori.	• Identifies at least one piece of supporting data reinforced with numerical evidence.		
(b)	As screen time increases, the amount of te reo Māori used will decrease. Accept discussion of Negative relationship in context.	• Describes negative association (screen time as explanatory variable).		
(c)	One advantage of using face-to-face interviews is that the mother can ask the interviewer for clarification of any questions about the te reo Māori scale used – for example, what it means for the child to introduce themselves in te reo Māori – making these results more accurate. OR people may be more likely to complete the survey when asked face-to-face. One disadvantage of using face-to-face interviews is that the mother may feel social desirability bias to respond in a more positive manner, exaggerating their child's ability and frequency of te reo Māori use. For example, a mother may say that their child sometimes greets people using te reo Māori when in fact it only rarely happens. Therefore, the results may paint a more positive picture than what actually is the current state of 4.5 year olds' use of te reo Māori. *Accept other valid advantages and disadvantages.*	• ONE general advantage AND ONE general disadvantage of face-to-face surveys given. OR EITHER ONE advantage OR ONE disadvantage described specifically in relation to te reo Māori use.	• ONE advantage AND one disadvantage described specifically in relation to te reo Māori use. OR EITHER ONE advantage OR ONE disadvantage described in relation to te reo Māori use AND its impact on the results of the survey discussed.	• ONE advantage AND ONE disadvantage described specifically in relation to te reo Māori use. AND Discussion of the impact on the results of the survey discussed for BOTH.
(d)	Comparison within a group Poll percentage difference 57% – 43% = 14% Margin of error is $\dfrac{1}{\sqrt{6104}} = 0.0128 = 1.3\%$ $2 \times$ MoE $= 2 \times 1.3\% = 2.6\%$ CI: $14\% \pm 2.6\%$ [11.4%, 16.6%] We can be fairly sure that the proportion of New Zealand children born in 2009 and 2010 who sometimes or often speak simple words in te reo Māori is somewhere between 11.4% and 16.6% lower than the proportion who rarely or never speak them. As this confidence interval is entirely positive, there is evidence to support the claim that *a lower proportion of New Zealand children born in 2009 and 2010 sometimes or often speak simple words in te reo Māori than rarely or never*.	• MOE ×2 (2.6%) AND the difference between the poll percentages (14%) correctly calculated. OR Correctly calculated an incorrect CI and both interpretation and claim are in context. OR Overlap method correctly calculated and BOTH claim and interpretation in context.	• Confidence interval correct. AND EITHER interpretation in context OR a response to the claim made in context.	• Confidence interval correct. AND Interpretation in context. AND A response to the claim made in context.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 – 14	15 – 18	19 – 24