Assessment Schedule 2022

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

Evidence Statement

Q	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
ONE (a)(i)	Margin of error is $\frac{1}{\sqrt{1000}} = 0.0316 = 3.2\%$	• Correct calculation of MOE. AND	• Correct MOE. AND	
(ii)	The margin of error is needed to take into account the natural **variation** that always occurs from sample to sample. For the BBC Good Food Nation study, every time a sample of parents are surveyed and asked questions about their children's eating habits we would expect slightly different results.	Explains why the MOE is required (generic).	Describes how the margin of error is required in the BBC Good Food Nation report context. Anything to do with the study is fine.	
(b)	The report states that 26% of children make their own dinner during pandemic lockdowns. This is below 30%, so outside the 30–70% guide. The rule of thumb MOE will overestimate the size of the MOE, and hence using it to construct an approximate 95% confidence interval for the population proportion of children who make their own dinner would result in a confidence interval that is wider than it needs to be.	• Identifies one survey percentage in context that is outside the 30–70% range.	• Identifies one survey percentage in context that is outside the 30–70% range. AND Explains that the rule of thumb MOE will **overestimate** the size of the MOE (accept will result in a **wider** confidence interval).	
(c)(i)	We need to know the sampling method used, and whether it was some sort of **random** sample of all UK children.		• States that need to know whether we have a **random** sampling method, other that they have been randomly selected.	

(ii)	One further variable to measure would be the age of the child surveyed. The parents of children aged between 5 and 16 years old were surveyed – younger children would be much less likely to use a knife to chop vegetables than older children. This means that the "over half" proportion is really UK children **who are old enough to use a knife safely** and chop vegetables. As they have included all ages of children in their proportion, this would be underestimating the proportion of children who are old enough and chop vegetables.		• A relevant further variable is identified. OR Discusses how it may impact on the claim.	• A relevant further variable is identified. AND Clear reason given as to how this variable would have an effect on the proportion that can chop vegetables. AND Discusses how it may impact on the claim.
(d)	Comparison within a group Poll percentage difference 59% – 11% = 48% Margin of error is $2 \times \frac{1}{\sqrt{1000}} = 0.0632 = 6.3\%$ (accept 6.4%) CI for difference: 48% ± 6.3% (41.7%, 54.3%) (accept 48% ± 6.4%) We can be fairly sure that the proportion of UK parents agree or strongly agree that their children are more interested in cooking at home during lockdown is somewhere between 41.7% and 54.3% more than the proportion of UK parents who disagree with this statement. As this confidence interval is entirely positive there is evidence to support the claim that a *higher proportion of UK parents agree or strongly agree that their children are more interested in cooking at home during lockdown than disagree with this statement.*	• Confidence interval correctly calculated. *If students have incorrect CI, but correct Interpretation and claim as per incorrect CI, then c.*	• Confidence interval correctly calculated. (AND EITHER CI interpreted correctly in context including population of "UK parents". OR Claim evaluated in context with justification.	• Confidence interval correctly calculated. AND CI interpreted correctly in context including population of "UK parents". AND Claim evaluated in context with justification.

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)	Explanatory variable: viewing material: a meme with an image and text or a "non-meme". Response variables: Participants' ratings of cuteness, humour, anxiety and positive emotions.	• Explanatory variable described in context. AND Response variables described in context.		
(b)(i)	Participants should be randomly allocated into either the meme with an image and text group or the non-meme group.	• States participants should be randomly allocated to the two treatment groups. OR	• States participants should be randomly allocated to the two treatment groups. AND	
(ii)	It is important to randomly allocate to the two groups, so that anything that might impact the response variable (eg sense of humour, base-line level of anxiety) should be balanced between the two groups – that is, there should be about the same number of anxious participants, and about the same number of chilled out participants in each group.	Basic comment about the need for random allocation.	Detailed comment about why they should be included; an example of a variable that could impact the response.	
(c)	Different participants might have different understandings of different words with the same meaning. By asking about humour using three different words (funny, amusing, and humorous), then taking an average, the researchers can use the average of the scores as a strong indication of the participants' overall feelings. For the anxiety and positive emotions scales – each word has a slightly different meaning (eg tense and stressed or calm and amused), but averaged together will give a good indication of the participants' overall anxiety levels and overall positive emotions.	• General comment stating that different participants have different understandings of the words.	• General comment stating that different participants have different understandings of the words AND by grouping them they average out to a reliable score.	• Specific comment including relevant examples from the report discussing that different participants have different understandings of the words, and by grouping them, they average out to a reliable score.
(d)	Potential issues: • The participants of the experiment were people from Mechanical Turk whose workers come from all over the world. Different cultures have different senses of humour, so it may be that the results do not transfer to NZers. • The experiment took place in December 2020 during a global pandemic. (eg.The results may not still hold when people are no longer stressed out from dealing with lockdowns and COVID generally). *Accept other reasonable responses.*	• Describes ONE potential issue with extending the results.	• Describes ONE potential issue with extending the results. AND Discusses how it may not be appropriate for NZers using specific features of the report.	• Describes TWO potential issues with extending the results. AND Discusses for both issues how they may not be appropriate for NZers using specific features of the report.

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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)
THREE (a)	Any suitable response e.g. Headline: "New Zealanders still some of the world's greatest pet lovers" Evidence: the report shows that 64% of NZ households have a companion animal, which is the second highest compared to the other countries.	• Writes suitable headline for report. AND Identifies supporting evidence from report including proportion. *NOTE: evidence may be included in headline.*		
(b)	756 of 1277 non-pet owners $\frac{756}{1277} = 0.5920\ (= 59.2\%)$ non-pet owners would like to have one. Margin of error is $\frac{1}{\sqrt{1277}} = 0.0280\ (= 2.8\%)$ CI for proportion: 0.5920 ± 0.0280 [0.564, 0.620] Alternatively CI for percentage: $59.2\% \pm 2.8\%$ (56.4%, 62.0%) We can be fairly sure that the proportion of all NZ households who don't currently have a companion animal, but would like one, is somewhere between 0.564 and 0.620. As this confidence interval is completely above 0.5 (the lower limit is 0.564), there is sufficient evidence to support the claim that *more than half of the households in New Zealand that don't currently have a companion animal would like to have one.*	• Confidence interval correctly calculated.	• Confidence interval correctly calculated. AND EITHER CI interpreted correctly in context including population ("NZers" minimum level). OR Claim evaluated in context with justification.	• Confidence interval correctly calculated. AND CI interpreted correctly in context including population ("NZers" minimum level). AND Claim evaluated in context with justification.
(c)	A nationally representative sample means that the sample looks like the target population however it is viewed. In this case, the proportion in the sample with different demographic features (e.g income, rural / urban, number of people in the household) will be about the same as the proportion in the population of NZ households.	• A general comment that the sample looks like the population.	• Specific comment which clearly identifies what a nationally representative sample means in this context, including the target population and groupings of income, rural / urban households and number of people in the household.	

(d)	Comparison between two independent groups. Poll proportion difference 0.67 – 0.64 = 0.03 Alternatively poll percentage difference 67% - 64% = 3% Margin of error is $1.5\times\left(\frac{\frac{1}{\sqrt{3599}}+\frac{1}{\sqrt{41622}}}{2}\right)=0.0162\,(=1.6\%)$ CI for difference in proportions: 0.03 ±0.0162 (0.014, 0.046) Alternatively CI for difference in percentages: 3% ±1.6% (1.4%, 4.6%) We can be fairly sure that the proportion of US households that have a pet is somewhere between 1.4% and 4.6% more than the proportion of NZ households that have a pet. As this confidence interval is entirely positive, there IS evidence to say that the US pet ownership is higher than the NZ pet ownership.	• Confidence interval correctly calculated.	• Confidence interval correctly calculated. AND EITHER CI interpreted correctly in context including population of "NZ" and "US". OR Claim evaluated in context with justification.	• Confidence interval correctly calculated. AND CI interpreted correctly in context including population of "NZ" and "US". AND Claim evaluated in context with justification.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 14	15 – 20	21 – 24