Assessment Schedule – 2017

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

Evidence Statement

ONE	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)	The explanatory variable are the sounds played to dogs e.g. silence and classical music. The response variable is stress level of the dog (or the difference in stress level for each dog between the two conditions).	The explanatory variable AND The response variable are described.		
(b)	Taking two measurements of stress from each dog allows the researchers to calculate the change in stress level for each dog between the two conditions (silence vs classical music). Each dog then acts as their own control, because each dog would have a pre-existing stress level (and this design feature minimises variation).	Calculation of change or difference identified.	Explanation about need to measure the change in stress level for each dog, since each dog is different in terms of pre-existing stress.	
(c)(i)	You need to know how the two groups were created and whether random allocation was used – were the dogs randomly assigned the order that they received the treatments / conditions? You need to know this so you can attribute the change in the response variable (the decrease in stress levels) to the treatment variable (the use of classical music vs silence) and not a confounding variable i.e. to establish causation.	Use of random allocation to assign dogs to order of conditions identified.	Need for random allocation to establish causation explained.	
(ii)	1. Study involved just one rehoming centre in one location (or just Scotland). The dogs who are at this homing centre have different behavioural characteristics in terms of stress than dogs at other rehoming centres (e.g. if the area is less affluent). 2. Study involved more male dogs (n = 34) than female dogs (n = 16), and the report states that male dogs seemed to respond better to the classical music than female dogs. Therefore, the results may not be able to be extended to both genders of dogs at rehoming centres. 3. Study involved a large proportion of Staffordshire bull terriers. The response to classical music may not be applicable to other types of dogs. Note: Extension limited to rehoming centres, not all dogs. 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 two potential issues with extending the results. AND Describes why each could limit extending the results by using specific features of the report / study.

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 OR 1 of c and 1 of j	2 of j	3 of j	1 of i with one potential issue.	1 of i with two potential issues.

TWO	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)(i)	The margin of error is $\frac{1}{\sqrt{n}}$ $= \frac{1}{\sqrt{500}} = 0.045$ or 4.5%	Demonstration of how the margin of error is calculated. AND Its use for interpreting survey percentages is explained.		
(ii)	The margin of error is needed to take into account the variation in survey percentages due to sampling.			
(b)	According to the report, 58% of the survey respondents have no idea what ingredients are in the food they feed their dog. Margin of error = 4.5% CI = 58% ± 4.5% (53.5%, 62.5%) I'm pretty sure that the percentage of Kiwi dog owners who (at the time of the survey) have no idea what ingredients are in the food they feed their dog is somewhere between 53.5% and 62.5%. There is evidence to support a claim over half of Kiwi dog owners (at the time of the survey) have no idea what ingredients are in the food they feed their dog, as lower limit of CI > 50%. *Accept other expressions of some uncertainty with the confidence interval provided such as "It's a fairly safe bet…" or "With 95% confidence…"* *95% certain → illustrates uncertainty.*	Confidence interval **correctly** calculated.	Confidence interval **correctly** calculated. AND Interpretation in context given OR Used to make a majority claim in context.	Confidence interval **correctly** calculated. AND Interpretation in context given. AND Used to make a majority claim in context.
(c)(i)	The survey was conducted by a dog food company that has a commercial interest in what Kiwi dog owners feed their dogs. For example, in the last sentence of the report the chief executive of K9 Natural states that the health conditions that dogs suffer from can be remedied by a natural, high-meat diet like K9.	Identifies that the company that funded the survey is a dog food company and describes one way the survey could be used to the company's advantage.	Explains why the findings of the survey could be used to the company's advantage with reference to the survey results reported.	
(ii)	1. Surveys were conducted using an online survey company (Survey Monkey). This could exclude dog owners who are not computer-literate, possibly older dog owners, who may feed their dog with traditional dog food and so have different views on what to feed dogs. 2. Dog owners self-reported the health issues their dog suffered and the owner's assessment of the health issues could vary in consistency from dog owner to dog owner (perhaps higher since 96% state that their dog is their much-loved family pet). Accept other reasonable non-sampling errors that can be linked to the information provided in the report.		One non-sampling error described.	One non-sampling error described. AND A reasonable example of how it could cause bias is given.

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 OR 1 of c and 1 of j	2 of j	3 of j	1 of i	2 of i

THREE	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)(i)	Margin of error = 3.6% Margin of error when 1000 surveyed = 3.2% Therefore, number of people surveyed in 1992 is less than 1000.	Number of NZers surveyed lower than 1000.		
(ii)	The percentage of New Zealanders in 1992 who supported spending on public transport was 25%. 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%. This particular survey percentage is outside this range. The margin of error for this survey percentage would be smaller than 3.6%.	Identifies that this particular survey percentage is outside the range of 30% to 70%.	A full explanation as to why it is inappropriate to use the reported margin of error, which includes reference to the size of the margin of error.	
(b)	Margin of error = 3.6%. Comparing two percentages within one group, so margin of error for comparison $= 2 \times 3.6\% = 7.2\%$. The difference between the two survey percentages is 48% – 37% = 11%. An approximate 95% confidence interval for the difference between the two percentages is: 11% ± 7.2% (3.8%, 18.2%). I'm pretty sure that the percentage of New Zealanders in 2012 who supported spending on public transport was somewhere between 3.8% (or percentage points) to 18.2% (or percentage points) higher than those who supported spending on public roads. **N.B. [Matches the CI constructed.]** This confidence interval supports a claim that a higher percentage of New Zealanders in 2012 supported spending on public transport than spending on roads because the confidence interval is entirely positive [zero is not within the CI].		The confidence interval for the difference between the two percentages is constructed.	The confidence interval for the difference between the two percentages is constructed. AND Interpretation in context given AND Is interpreted as part of the explanation as to why the claim can be supported.
(c)	1. The support for spending on public transport, based on survey percentages for 1992 and 2012, has nearly doubled from 25% to 48% but not quite doubled (a difference of 23%). If a confidence interval was constructed, the true difference could be lower than 23%. 2. In 1992, support for public transport was just over half of that for roads / motorways (0.25 / 0.43). In 2012, support for public transport was nearly 1.3 times that for roads / motorways (0.48 / 0.37). So the support for public transport (as a ratio of roads / motorways) has more than doubled ($\frac{1.30}{0.58} = 2.24$).	Survey percentages for spending on public transport compared for 1992 and 2012.	Survey percentages for spending on public transport compared for 1992 and 2012 and used to form a convincing argument for/against the claim in the headline.	Survey percentages for spending on public transport compared for 1992 and 2012 and used to form a convincing argument for/against the claim in the headline that takes into account sampling variability OR demonstrates a very high level of reasoning.

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 OR 1 of c and 1 of j	2 of j	3 of j	1 of i	2 of i

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24