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SUPERVISOR'S USE ONLY

91584

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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
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QUALIFY FOR THE FUTURE WORLD
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Level 3 Mathematics and Statistics (Statistics), 2017

91584 Evaluate statistically based reports

9.30 a.m. Monday 27 November 2017
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.

Merit

TOTAL 16

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QUESTION ONE

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

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

Explanatory variable: The group of dogs observed in silence and the group of dogs listening to classical music

Response variable: The stress levels of the dogs

(b) The report states that "... dogs' stress levels decreased after listening to classical music".

Explain why each dog's stress levels were measured twice.

The dogs stress levels were measured through heart rater, saliva samples and observation ~~behaviour~~ of their behavior. These were measured twice ~~on~~ to reduce samping error. Also, what the dog was doing before its stress levels were measured would impact the results. If the dog had been running outside, it would therefore have a higher heart rate than a dog who had been sleeping

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(c) The report claims that "Classical music has a calming effect on dogs in rehoming centres".

(i) In terms of the design of the study (specifically the order of the conditions), what else do you need to know before assessing this claim, and why?

You would need to know the age of the dogs the results could differ between old dogs and puppies. Also, the background of the animal could be useful, if it is in a rehoming centre it is quite likely something has occured in the dogs past which could change its behavior.

as puppies are generally more energetic.

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

Discuss TWO potential issues with extending the results of this study to all dogs in rehoming centres.

1. In rehoming centres, there will be different numbers of dogs, a mixture of male and female dogs and a number of different breeds. In the study by the Scottish SPCA, there were 50 dogs which included 34 male and 21 that were bull terriers (all the same breed) therefore this is not a wide range of dogs sampled. this could have impacted the results which would differ to other rehoming centres, depending on the breeds of dogs they have.

2. Extending the results of this study to all dogs in rehoming centres comes of a cost. "The effect only lasted for a short period, with stress levels returning to normal after one day in some cases" the emotional impact of classical music on dogs does not last long enough for it to be worthwhile. Thus, extending the results inappropriately could ~~[illegible]~~ essentially create a false claim within all rehoming centres.

QUESTION TWO

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*Refer to **Report 2** in the resource booklet to answer the following questions.*

(a) The report states that 500 dog owners were surveyed.

(i) Calculate the margin of error for this survey.

$1/\sqrt{500} = 0.0447$

$= 4.47\%$

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

The margin of error is essential in all statistical survey reports it is used to construct a confidence interval that 95% of the data should fit in to.

(b) Assume that the sample of New Zealand dog owners was representative of all New Zealand dog owners at the time of the survey.

Can a claim be made that over half of New Zealand dog owners have no idea what ingredients are in the food they feed their dog?

Using a relevant survey percentage provided in the report, construct a confidence interval, and interpret this interval as part of your answer.

"Over half (58%) have no idea what ingredients are in the food they feed their dog."

Confidence interval = 53.53% - 62.47%

Therefore, as a result of this confidence interval a claim can be made that over half of New Zealand dog owners have no idea what ingredients are in the food they feed their dog as 53.53% is over 50%, = over half.

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(c) The report states that the K9 Natural survey "revealed that 40% of dogs suffer from an array of health conditions".

(i) One component to consider when evaluating statistical survey reports is who funded the study.

Explain why there is a potential issue with who funded this survey.

K9 Natural funded the survey they are a raw dog food business who believe that, "muscle and joint issues, skin problems, bloating and low energy levels can be remedied by a natural high meat diet like K9 Natural" this could create an issue of bias. From reading the article K9 Natural are wanting dog owners to buy their product. This means that they are only going to show the statistics that put their company in a better

extra paper

(ii) Discuss ONE potential non-sampling error for this survey and how it could cause bias.

One potential non-sampling error for this survey is a dog already having an unknown ~~health~~ health issue before the survey had ~~began~~ started. This would impact the results as dog owners may think it has a health condition like bloating, but it is actually much worse. K9 Natural would therefore not work on the dog.

QUESTION THREE

ASSESSOR'S USE ONLY

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

(a) The survey states that the margin of error for both the 1992 and 2012 surveys was 3.6%.

(i) If 1000 New Zealanders had been surveyed, the reported margin of error would be 3.2%.

Was the number of New Zealanders surveyed in 1992 higher or lower than 1000?

Support your answer with statistical reasoning.

It was lower than 1000

- A larger population has a smaller margin of error.

(ii) Explain why it would be inappropriate to use the reported margin of error to construct an approximate 95% confidence interval for the percentage of New Zealanders in 1992 who supported spending on public transport.

For the margin of error to work, it must be between 30% - 70%. 25% of New Zealanders in 1992 supported spending on public transport. this is not between 30% and 70%

(b) The report states that for the 2012 survey "those supporting priority spending on public transport had grown to 48 per cent, compared with 37 per cent favouring roads".

Could a claim be made that a higher percentage of New Zealanders in 2012 supported spending on public transport than spending on roads?

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

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(c) The headline for the report states "Poll shows preference for public transport over motorways and roads has doubled in 20 years".

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

In 1992, 43% of people surveyed preferred Government spending on motorways and other public roads, compared to 25% of people supporting spending on public transport. In 2012, 37% of people surveyed favoured spending on roads and motorways and 48% of people preferred government spending on motorways. These statistical results suggest that yes, polls show preference for public transport over motorways and roads and it had almost doubled in 20 years. However, they gives the people surveyed the option to answer "neither/both/unsure" - which impacts the results of the other two options as they do not know what people are choosing when they put themselves in that category. Also, even though they claim that their Nationwide telephone survey had sophisticated quotas and weights to ensure the sample is as representative as possible, a telephone survey is not an accurate overview of the population. Only limited people ~~can~~ have telephones in their house or answer and are willing to take part. Therefore the people surveyed are likely to be old people who enjoy taking surveys often. Overall, there is statistical evidence to support this headline, ~~debate~~ although it is not all correct.

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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Question TWO (c) (i)

light, they are essentially advertising K9 natural through the means of a news article when they claim that 40% of dogs suffer from an array of health conditions, they do not include what these conditions are, meaning that in reality most of them may not be able to be fixed by K9 Natural. They are only showing the public their best in order to attract new customers, which leads to the potential issue of bias.

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Merit exemplar 2017

Subject:	Statistics	Standard:	91584	Total score:	16

Q	Grade score	Annotation
1	E7	1(a) Explanatory and response variables described 1(b) Doesn't clearly articulate paired comparison design 1(c)(i) Discusses confounding variables rather than design features of experiment 1(c)(ii) Point 1 discusses specific characteristics about the dogs in the study, point 2 does not discuss the issue of generalisability.
2	M5	2(a)(i) Margin of error correctly calculated 2(a)(ii) Explanation incorrect "95% of the data should fit into" 2(b) Response does not interpret the confidence interval, and also presents the confidence interval incorrectly 53.53% - 62.47% 2(c)(i) Explanation uses quote from the statistical report to support point. 2(c)(ii) Doesn't clearly articulate a relevant non-sampling error
3	A4	3(a)(i) Correct reasoning, error with use of "population" rather than "sample size" 3(a)(ii) Identifies 25% outside guidelines for rule of thumb (30% - 70%) but doesn't explain why it would be inappropriate to use the reported margin of error 3(c) Uses relevant survey percentages from report but does not build strong argument when evaluating statistical evidence, nor refers to sampling variation.