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Draw a cross through the box (☒) if you have NOT written in this booklet

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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 3 Mathematics and Statistics (Statistics) 2024

91584 Evaluate statistically based reports

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.

Make sure that you have the Formulae and Tables Booklet L3–STATF.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement TOTAL 09

QUESTION ONE: UK ADULTS DON'T KNOW THE LOCATION OF THEIR BODY PARTS, NEW RESEARCH SHOWS

Refer to Resource One in the resource booklet to answer the following question parts.

(a) The Pall Mall survey media release did not include any information about the survey questions used to locate body parts, but HOW the survey questions were asked is important for correct interpretation of the results of the survey.

Give an example of how the responders' ability to locate body parts could have been measured in this survey.

They could have been measured by inserting fake body parts into a drawing of the outline and their ability to place the body parts in the right places would have been measured, or if the men and women whom took part in this survey just pointed to their own body parts in their own body and people from Pall Mall would judge their ability based off that.

(b) Construct and interpret a confidence interval for the proportion of UK men and women who can confidently state where their rectum is located.

According to the graph, there is 55% of men and women, who can sucessfully locate where their Rectum is located. The survey also states there were 2000 UK adults who took part in this survey. $n = 2000$

$moe = \frac{1}{\sqrt{n}} \times 100$ $\quad moe = \frac{1}{\sqrt{2000}} \times 100 = 2.2\%$

52.8% 55% 57.2%

$55\% + 2.2\% = 57.2\%$

$55\% - 2.2\% = 52.8\%$

The margin of error takes into account, any natural variation. Because the confidence interval lies within 30% - 70% ~~the can~~ the pall mall survey carried out by OnePoll, can confidently make the claim that 55% of men and women in the UK can confidently state where their rectum is located.

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

Explain whether there is a potential issue with the source of funding for this study.

Pall Mall (Medical) commissioned this survey. Pall Mall (medical) is a "leading" private healthcare clinic. They also state at the bottom of the report they offer outstanding services to self paying patients, or patients with private healthcare insurance. All of this advertising (for Pall Mall) on this report means there is potential biased with the study. The survey and report makes Pall Mall look like the best people to turn too. Dr Chan Tang says "hopefully these results carry a serious message about the importance of knowing our ~~body~~ bodies". It seems as thought their true intentions were to make their clinic look the best.

(d) A different media report from the same study used the following headline:

"Butt of the Joke: Survey finds people easily locate their rear, but the hunt for their 'private parts' is tricky!"

Is the headline correct with the implication that a higher proportion of UK men and women can confidently locate their rectum than their reproductive organs?

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

confidently locate rectum = 55%.

confidently locate reproductive organs = 52%.

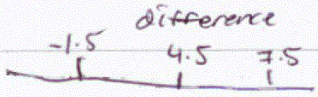
$n = 2000$

$\frac{1}{\sqrt{2000}} \times 2 \times 100 = 4.5$

$55\% - 52\% = 3\%$

$3\% + 4.5 = 7.5$

$3\% - 4.5 = -1.5$



because the confidence is below 0, we cannot confidently claim that ~~58%~~ UK men + women can confidently locate their rectum than their reproductive organs.

(e) The Pall Mall survey was carried out by OnePoll, a UK online research agency. OnePoll describes their 'panel' as a community of UK adults who have registered to take part in market research and opinion polls. When panellists join OnePoll, they agree to participate in at least three surveys per year for which they get paid the equivalent of between 40c and $NZ1. Members of the panel can claim payment when their total has reached the equivalent of approximately $NZ50.

OnePoll sent the Pall Mall survey to a sample from their panel who fit the target population.

Discuss whether the OnePoll sampling method is likely to generate a representative sample of all UK men and women.

Support your answer with statistical reasoning, including clearly identifying the target population, the sampling frame, and at least one potential non-sampling error.

The One Poll sampling method isn't likely to generate a representative sample of UK men and women. The target population was adult men and women of the united kingdom. However the sampling frame frame of this survey was a community of UK adults who have registered ~~to take~~ part in market research and opinion polls. One potential non-sampling error in this study is how they are ~~testing the~~ measuring how well UK adults can locate body parts. ~~This is hard to measure~~ we dont know how this is measured, this could mean that the people taking part in the survey point to a general area of ~~it~~ where the ~~a~~ body part is located, or they have to be specific. ether way, this makes it hard to get an exact measurement of how well the participants can locate body parts.

QUESTION TWO: SOCKS-OVER-SHOES PROVEN AS MEANS OF REDUCING WINTER FALLS

Refer to Resource Two in the resource booklet to answer the following question parts.

(a) The study reported results on three outcome variables including: self-rated slipperiness, observer-rated slipperiness, and the time it took to descend the slope.

Discuss why the researchers chose to use self-rated slipperiness as their primary outcome instead of the time it took to descend the slope.

Reasearchers may have chosen to use self rated slipperiness as their primary ~~to~~ outcome, because the trial was to see if wearing socks reduced falls, not ~~incread~~ increased/ decreased walking time.

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

Explanatory variable: is how slippery walking down the slope is

Response variable: ~~is how slippery walking down the slope was~~ if wearing socks affects the slipperiness.

(c) It was not possible to blind the participants or the outcome assessors to the treatment allocation in this study.

(i) Describe why blinding was not possible in this situation.

It would have been too dangerous, it is a public area, and there may have been people walking that weren't apart of the survey.

(ii) Discuss TWO measures that the researchers used in this study to minimise the impact of not blinding the participants and, for each, describe how these measures may have helped minimise bias in this study.

Measure one: They took photo's of the participants ~~footwear~~ to take into account the characteristics of the ~~footwear~~, ~~socks~~ such as very grippy, or not grippy ~~footwear~~.

Measure two: The researchers didn't tell participants the true reason of the study, instead they said this study was to assess the performance of different types of ~~footwear~~ & different types of ~~socks~~ socks, ~~tested~~. This ~~was~~ was to prevent any kind of bais in terms of participant skewing the results on purpose.

(d) Recruiters for the study administered a baseline questionnaire to participants, which included details about potential confounding variables, shown in Table 2(a).

Discuss TWO of these variables and, for each, describe how they may have been confounding, and their potential effect on the findings of this study.

Variable one: previous falls on ice. This could affect the results of the graph, because someone who has fallen on ice alot might be alot more cautious when walking, compared to someone that hasn't fallen much. Therefore they are potentially less likely to fall over.

Variable two: First winter in icy conditions. This is a potential cofounding variable because if someone has ~~new~~ never been in icy conditions ~~before~~ before, they might not know to be cautious, and therefore could affect the results of the graph, as they may fall over alot more, then someone who has walked in icy conditions before.

QUESTION THREE: 50% OF MEN SURVEYED THINK THEY COULD LAND A PASSENGER PLANE – EXPERTS DISAGREE

Refer to Resource Three in the resource booklet to answer the following question parts.

(a) The *New Zealand Herald* headline for Resource Three (a) is: "50% of men surveyed think they could land a passenger plane – experts disagree."

Explain how evidence from this report has been used to generate this headline.

NZ Herald has taken the results from the graph that state 20% of men could very confidently land a plane, aswell as 26% of men who are somewhat confident, added the percentages together and rounded up to 50% to word the headline in a way people would be intreged to read.

(b) Identify one of the survey percentages in the YouGov study, and explain why it would not be appropriate to use the rule of thumb for the margin of error to construct an approximate 95% confidence interval for the population proportion, using this survey percentage.

a survey percent that ~~would~~ could be used to explain why it would not be appropriate to use the rule of ~~thumb for~~ is 20% of American males are very confident they could safely land a passenger airplane in an emergency situation, relying on ~~city~~ only the assistance of air traffic control. This is because 20% isn't within 30% - 70% confidence interval, rule of thumb. Therefore it is too big to make a claim.

Question Three continues on the next page.

(c) Resource Three (a) and Resource Three (b) are from two different studies.

Discuss the main differences between the designs of these two studies.

Support your answer with statistical reasoning, including clearly justifying the study designs, the types of inferences (claims) that can be made, and the assumptions needed to do so.

Resource Three (a): YouGov study

Study design: This study is observational. The results are based on the participants opinions.

Inferences: They claim that nearly 50% of male Americans think they could confidently land a passenger aircraft ~~craft~~ with air traffic ~~conti~~ controls help. safely.

Assumptions: they've made this ~~assup~~ assumption based on their results

Resource Three (b): University of Waikato study

Study design: The design of this study, is to see if the results are skewed based off participants watching a video beforehand. This is an experimental study.

Inferences: they claim that watching a video on pilots landing a plane inflated peoples confidence.

Assumptions: they've made this assumption based on their results.

(d) In Resource Three (b), the study researchers concluded that "We found watching the video inflated people's confidence that they could land a plane."

Using evidence from Figure 3, write TWO comparative comments that support the study researchers' conclusion.

Comment one: ~~more than 60%~~ with about ~~goat~~ quarter of participants, more then 60 per cent confident ~~t~~ they could land a plane.

Comment two: half at least 30% confident they could land a plane.

(e) In the study from Resource Three (b), participants either watched a video or not, then were told:

"Now we're going to ask you a few questions. Don't try to analyse and puzzle things out – just go with your gut feel or hunch. Respond as quickly as possible within a couple of seconds. Remember this is an emergency situation."

Participants answered the following questions in this order:

Q1: "How confident are you that you would be able to land the plane without dying?" (0 = not at all confident, 100 = very confident)

Q2: "How confident are you that you would be able to successfully land the plane as well as a pilot could?" (0 = not at all confident, 100 = very confident).

In a second repeated study (with new participants), the researchers randomised the order of these two questions, with approximately half of the participants asked the questions in the order above, and half asked in the opposite order.

Explain why the researchers asked the questions in different orders.

This is because, whichever question they hear first, could make the participant believe that the second question is a lot harder / easier in comparison to the first question asked. Therefore their answer may be varied depending on the order.

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

QUESTION NUMBER

1

(c) In doing so, it may also cause concern amongst men + women in the UK, so in return, visit Pall Mall Medical to get checked up, because they were the clinic to make them aware. However this survey seems like a marketing tatic to get more business, therefore, because they are private, and want the results of the survey to make uk worry, they are more likely to be baised, therefore there is a potential issue with this study, based on the funding of it.

Achievement

Subject: Statistics

Standard: 91584

Total score: 9

Q	Grade score	Marker commentary
One	A4	1(a) – provides two good suggestions, either are acceptable, as only one is required. 1(b) – Confidence interval is correctly constructed, but doesn't correctly interpret the confidence interval. 1(c) – Identifies the survey is funded by a private company and describes how survey can be used to the company's advantage. Doesn't explain in detail or describe how/why this issue could impact the study. 1(d) Confidence interval is correctly constructed. There is no interpretation of the confidence interval, and the claim is incorrect "*because the confidence is below 0*" is incorrect. 1(e) – Target population and sampling frame correctly identified. There is no clear explanation of the likely representativeness of the sample, nor how/why this issue affects the finding of this study.
Two	N2	2(a) - Identifies self-rated slipperiness as the study goal, but no discussion linking the study goal in greater context. 2(b) – Both the explanatory and response variables incorrect. 2(c) – part (i) does not explain why blinding (in a statistical context) is not possible (with references to socks being worn over shoes or not). As (i) is incorrect, then (ii) is not considered. However, for reference, neither response in (ii) contains a description of how the measures may have minimised the impact of not blinding. 2(d) – Two potential confounding variables are identified, but neither clearly discusses how the confounding variable may interacts with the response variables.
Three	A3	3(a) – Identifies evidence (with %) correctly and explains how the 50% is reached. 3(b) – Identifies 20% 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) – Identifies the study design for both (a) and (b) correctly, but doesn't identify the <u>type</u> of inference or make correct assumptions for either study.

		3(d) – Does not make two comparative comments about two features in context of the graph in Figure 1. The comments made are from the text of the resource, are not comparative. 3(e) – Identifies the concept of order effect, but doesn't link to the context of this study.