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NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 3 Mathematics and Statistics (Statistics), 2013

91584 Evaluate statistically based reports

9.30 am Wednesday 20 November 2013
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.

Show ALL working.

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

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–11 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.

TOTAL

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You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE: SCHOOL UNIFORMS

Kiwis agree – make uniforms for school students compulsory!
NZ Times,* 15 August, 2013

New Zealanders have had enough of finding clothes for school and want all school students to wear uniforms to reduce clothing costs, new research shows.

Over half of Kiwis think that all school students should wear uniforms, with the main reason for making uniforms compulsory being the cost of clothes.

Parents claim that it is cheaper in the long run to buy school uniforms, which can be bought second hand and resold when they have been outgrown. 54% of respondents agreed that school uniforms should be made compulsory, and that it would result in a reduced clothing cost for parents.

There is concern that too much pressure is placed on wearing "cool" clothes to school, and that having a school uniform removes this pressure, as every student is dressed the same.

The survey involved 400 people aged 18 and over, and was conducted by telephone between 23 July and 30 July 2013. The margin of error is 5%.

Some results from the survey are summarised in the tables below:

Do you agree that school uniforms should be compulsory for all school students? (n = 400)		
Yes	No	Undecided
54.0%	41.2%	4.8%

What is the main reason why you agree that school uniforms should be compulsory for all school students? (n = 216)			
Decrease cost of clothing	Reduce pressure to wear "cool" clothes	Improve pride in appearance	Other
52.3%	36.3%	8.5%	2.9%

(a) (i) The article states that the margin of error is 5%.

Show how this margin of error was calculated, and explain why the margin of error should be included in statistical survey reports.

* *NZ Times* is a fictional newspaper.

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(ii) Is there statistical evidence to support the claim that "over half of Kiwis think that all school students should wear uniforms"?

(b) The article claims that the main reason for making uniforms compulsory is the cost of clothing.

Explain whether or not this claim is justified.

In your answer, you should:

- compare the survey percentages of the two options with the highest results in response to the question "What is the main reason why you agree that school uniforms should be compulsory for all school students?"
- show calculations that support your explanation.

(c) Fully describe TWO potential non-sampling errors in this survey, and discuss how they could cause bias in this survey.

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QUESTION TWO: UNIVERSITY COSTS

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No holidays for students struggling to cover rising university costs
NZ Times, 14 April, 2013

A new survey of university students shows that many students are struggling to find a work-life balance, experiencing stress and increasing pressure as they try to balance their university study with the costs of attending university. 37% of students will work full-time during the university holidays to save money for university fees and accommodation costs, rather than using the holidays to relax and refresh.

41% of students surveyed spent at least 10 hours a week in a part-time job. Additionally, students who work part-time can also expect their grade point average (GPA) to drop by around 0.2 points for every extra hour they spend in a part-time job each week.

The national student representative organisation points to the survey as evidence that something needs to be done to make university affordable to students. "83% of students surveyed agreed that financial pressures caused them to under-achieve at university, which makes this a significant issue that needs attention now," said a spokesperson from the organisation.

Some of the questions in the survey included:

(1) Will you spend your holidays working full-time so you can cover your university fees and accommodation costs?

(2) Would you agree that some form of financial stress during the year caused you not to achieve the grades you could have?

(3) What was your GPA this year?

(4) How many hours do you spend in part-time work each week?

A random sample of students was taken from all students who attend university in New Zealand. The survey was conducted by email, with respondents offered the chance of winning a smartphone. Responses were received from 1 982 students. The non-response rate was 6.7%.

Additional notes: A GPA is a numerical measure determined by the grades awarded to students. It falls on a scale from 0 to 9. The higher the GPA, the better the grades.

(a) Identify the target population for this survey.

Explain whether or not the process used to obtain the sample of students is likely to have produced a representative sample for this target population.

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(b) The report states that "41% of students surveyed spent at least 10 hours a week in a part-time job."

Calculate a confidence interval for this survey percentage, and interpret this confidence interval.

(c) Identify a potential difficulty with the wording of any one of the survey questions listed in the report.

(d) The report claims that "… students who work part-time can also expect their GPA to drop by around 0.2 points for every extra hour they spend in a part-time job each week."

Describe a statistical process that could have been used to make this claim, and discuss what other information you would need to evaluate this claim.

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QUESTION THREE: SUMMER HOLIDAYS

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Getting outside during the summer holidays key to happiness
NZ Times, 11 November, 2013

Why do many of the images that we see in commercials, movies, and stories convey summer as a time of happiness?

A new study claims the reason why we feel happy during summer is because of the effects of exposure to the sun. It's simple, researchers say – the more time you spend outside in the sun, the happier you will feel. Increased sun exposure equals increased happiness.

The study involved a group of 52 people aged 18 to 35 years over a period of four consecutive summers. At the end of each summer, participants were asked to recall the number of days they had spent in the sun, and to give a rating of how happy they felt on a scale of 1 to 5 (1 = not happy and 5 = extremely happy).

Two categories were established for the participants – those who spent less than half of the sunny days available in the sun (low exposure), and those who spent at least half of the sunny days available in the sun (high exposure). Participants in the "low sun exposure" group gave an average rating of 3.6, while participants in the "high sun exposure" group gave an average rating of 4.4.

These results are consistent with results from other studies that show that light therapy (as a replacement for the sun) as a treatment through winter can make people happier.

The study was commissioned by a sunscreen manufacturing company. The study report included a recommendation that during summer, people make sure they are wearing sunscreen to protect themselves from the negative effects of sun exposure.

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

(b) Explain whether this study is an observational study or an experiment.

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(c) Explain whether or not the statistical evidence presented in the article is sufficient to support the claim that "increased sun exposure equals increased happiness".

Question Three continues on the following page.

(d) Potential issues with statistical studies are:

- using the past as a source of data
- confounding variables
- extending the results inappropriately.

Select two of these issues that might be a problem in this study with regards to the claim made that "increased sun exposure equals increased happiness".

Discuss why each issue selected may be a problem, and suggest how this issue could be managed for future studies in this area.

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

QUESTION NUMBER

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