

3

91585M



NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

SUPERVISOR'S USE ONLY

Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2018

91585M Te whakahāngai ariā tūponotanga hei whakaoti rapanga

9.30 i te ata Rāpare 22 Whiringa-ā-rangi 2018
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakahāngai ariā tūponotanga hei whakaoti rapanga.	Te whakahāngai ariā tūponotanga mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai ariā tūponotanga mā te whakaaro waitara hōhonu hei whakaoti rapanga.

Tirohia mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Tuhia ō mahinga KATOA.

Tirohia mēnā kei a koe te Pukapuka Tikanga Tātai me ngā Tūtohi L3–STATMF.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ā, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

- (a) I mātaihia e tētahi rangahau mō te whakatairanga kai i te tau 2017 i Aotearoa ngā paetukutuku 70 a ngā tino kamupene kai me te inu. E 24 o ēnei paetukutuku i te arotahi ki ngā taiohi, ā, ko ērā atu i arotahi kē atu ki te taupori whānui. I pai ngā whakapae mō te hauora o te 21 o ngā paetukutuku, ā, o aua paetukutuku, e waru i arotahi atu ki ngā taiohi.

Ka tīpako matapōkeretia tētahi o ēnei paetukutuku.

- (i) Whakamāramahia mai te take ehara ngā pāpono “he pai te whakapae mō te hauora a tētahi paetukutuku”, ā, “ka arotahi tētahi paetukutuku ki te taupori whānui” i te tāuke tētahi i tētahi.

Tautokona tō tuhinga mā tētahi tātaitanga kotahi i te iti rawa.

- (ii) E tautoko ana ngā raraunga mai i tēnei rangahau i te whakapae e rua whakareanga ake pea te tūponotanga ka puta i tētahi paetukutuku he whakapae pai mō te hauora mēnā e arotahi ana te paetukutuku ki ngā taiohi kua kē ki te taupori whānui?

Tautokona tō tuhinga mā ngā tātaitanga.

QUESTION ONE

- (a) A 2017 food marketing study from New Zealand examined 70 websites belonging to the most popular food and drink brands. 24 of these websites were targeted at teenagers, while the others were targeted at the general population. 21 of the websites made a positive health claim, and of these websites, eight were targeted at teenagers.

One of the websites is chosen at random.

- (i) Explain why the events “a website makes a positive health claim” and “a website is targeted at the general population” are not mutually exclusive.

Support your answer with at least one calculation.

- (ii) Does the data from this study support the claim that it is more than twice as likely that a website makes a positive health claim if the website is targeted at teenagers rather than the general population?

Support your answer with calculations.

- (b) I hangaia he tauira e matapae ana i te momo pēniho ka hokona e tētahi tangata e ai ki ngā āhuatanga rerekē o te tangata, me ngā mea taurangi pērā i te taipakeke, te moni whiwhi, me te tūnga mārena. Hei whakamātau i te tauira, 100 ngā tāngata i uiuitia, ā, i whakatauritea te momo pēniho ake i hokona mai e ia tangata ki te momo i matapaetia e te tauira.

E whakaatu ana te tūtohi i raro i ngā otinga o tēnei whakamātau.

Momo ake	Momo i matapaetia		
	A	B	C
A	18	3	5
B	5	38	9
C	12	2	8

- (i) Tātaihia te ōrau o ngā matapae i te tika (he ōrite te momo i matapaetia ki te momo ake).

- (ii) Homai kia KOTAHI te raruraru ka taea mō te tōtikatanga o te tauira mō ngā momo rerekē, e ai ki ngā raraunga i tukuna i runga ake.

Tautokona tō whakautu mā ngā tātaitanga tāpiri e rua i te iti rawa ki te wāhanga (i).

- (iii) E toru ngā tāngata i tīpakohia mai i te rangahau.

Tātaihia te tūponotanga i hē te matapae a te tauira i te momo pēniho mō te tangata kotahi anake o ēnei tokotoru.

Tuhia ngā whakapae ka puta me te whakamārama he aha te take me puta ēnei.

- (b) A model has been developed that predicts the brand of toothpaste someone will purchase based on various characteristics of the person, including variables such as age, income, and marital status. To test the model, 100 people were surveyed, and the actual brand of toothpaste purchased by each person was compared to the predicted brand from the model.

The table below shows the results of this test.

Actual brand	Predicted brand		
	A	B	C
A	18	3	5
B	5	38	9
C	12	2	8

- (i) Calculate the percentage of the predictions that were correct (the predicted brand was the same as the actual brand).

- (ii) Give ONE potential issue with the appropriateness of the model for the different brands, based on the data provided above.

Support your answer with at least two additional calculations to part (i).

- (iii) Three of the people from the survey were selected.

Calculate the probability that the model incorrectly predicted the brand of toothpaste for only one of these three people.

State any assumptions made and explain why these need to be made.

TŪMAHI TUARUA

E 349 ngā kura tuarua i Aotearoa i te tīmatanga o te tau 2018. I tautapatia ngā kura tuarua katoa i Aotearoa hei kura kei Te Ika-a-Māui, kei Te Waipounamu rānei.

- 12.9% o ēnei kura he kura tāne
- 71.1% o ngā kura tāne kei Te Ika-a-Māui
- 23.0% o ngā kura kōtiro, tāne-kōtiro rānei kei Te Waipounamu.

Ka tīpako matapōkeretia tētahi o ēnei kura tuarua.

- (a) Tātaihia te tūponotanga kei Te Ika-a-Māui taua kura tuarua.

- (b) Me kī ko B te pāpono “he kura tāne”, ā, ko N te pāpono “he kura kei Te Ika-a-Māui”.

Me tātai me te whakamahi i a $P(N | B)$ me $P(N)$ ki te whakamārama mēnā he wehe kē ngā pāpono B me N .

QUESTION TWO

There were 349 secondary schools in New Zealand at the start of 2018. All secondary schools in New Zealand were designated as being in the North Island or South Island.

- 12.9% of these schools are boys' schools
- 71.1% of the boys' schools are in the North Island
- 23.0% of the girls' or co-educational schools are in the South Island

One of these secondary schools is selected at random.

- (a) Calculate the probability that the secondary school is in the North Island.

- (b) Let B be the event “a boys' school” and let N be the event “a North Island school”.

Calculate and use $P(N | B)$ and $P(N)$ to explain whether events B and N are independent.

(c) Ka puta i ngā tātaritanga atu anō o ngā kura 349 ngā mōhiohio e whai ake:

- I whakatauhia ko ngā kura tuarua katoa i Aotearoa he kura tūmataiti, he kura kāwanatanga (kei roto ngā kura hourua i tēnei) rānei.
- 16 he kura tāne-kōtiro tūmataiti.
- O ngā kura tāne, kotahi anake he tūmataiti.
- 331 he kura kāwanatanga.
- 71.0% o ngā kura kāwanatanga he kura tāne-kōtiro.

Tātaihia te tūponotanga mō tētahi kura tuarua ka tīpako matapōkeretia he kura kāwanatanga kōtiro.

**Ka haere tonu te Tūmahi
Tuarua i te whārangi 10**

(c) Further analysis of the 349 schools provides the following information:

- All secondary schools in New Zealand were designated as either private or state (which includes partnership schools).
- 16 are private co-educational schools.
- Of the boys' schools, only one is private.
- 331 are state schools.
- 71.0% of state schools are co-educational.

Calculate the probability that a secondary school selected at random is a state girls' school.

**Question Two continues
on page 11.**

- (d) Ka whakatauhia ngā kura tuarua 349 e ai ki ngā taipakeke o ngā ākonga o tā rātau rārangi ingoa. E 236 ngā kura i whakatauhia he Tau 9 - 13, ā, ko te 113 ka whakatauhia he kura momo kē.

I tonoa tētahi akomanga o ngā ākonga Tauanga Tau 13 e tō rātou kaiako kia tīpako i te tīpakonga matapōkere o ngā kura tuarua 50, me te whakakapi, mai i ngā kura tuarua 349. Ko ngā otinga i puta i tētahi ākonga kotahi he 25 ngā kura he Tau 9 ki te 13 i roto i tana tīpako o ngā kura tuarua 50.

- (i) Whakamāramahia mai te take e māharahara ana pea te kaiako kāore i tīpako matapōkeretia e te ākonga ngā kura tuarua 50.

Tautokona tō whakautu mā ngā tātaitanga e whakataurite ana i ngā tataui i **tūmanakohia**, me ērā i **kitea**.

- (d) The 349 secondary schools are classified based on the ages of the students on their roll. There are 236 schools classified as Year 9 to 13, and 113 other schools.

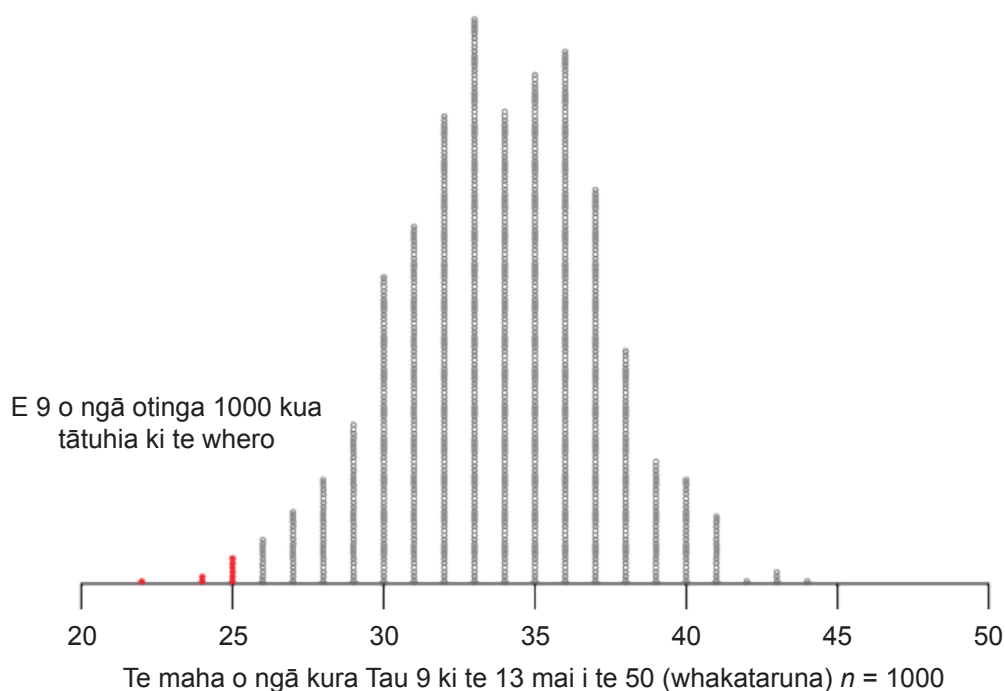
A class of Year 13 Statistics students was asked by their teacher to each select a random sample of 50 secondary schools, with replacement, from the 349 secondary schools. The results produced by one student contained 25 schools that were Year 9 to 13 in her sample of 50 secondary schools.

- (i) Explain why the teacher might be suspicious that the student did not randomly select the 50 secondary schools.

Support your answer with calculations comparing **expected** and **observed** counts.

- (ii) I hoahoatia, i whakahaerehia e te kaiako tētahi whakataruna hei tūhura mēnā ka taea ngā otinga a te ākonga, ina i tīpako matapōkeretia e te ākonga ngā kura tuarua 50. Mō ia whakamātau, i tīpako matapōkeretia e ia ngā kura 50 me ngā whakakapi mai i ngā kura tuarua 349, me te tuhi e hia o ēnei kura 50 he kura Tau 9 ki te 13.

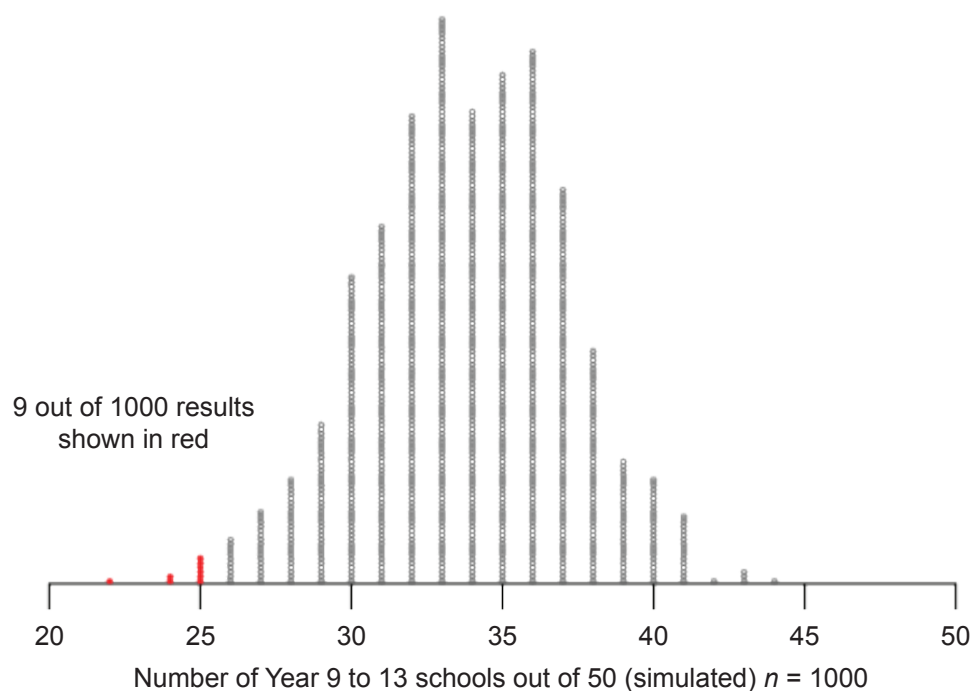
E whakaaturia ana i raro tētahi whakarāpopotonga o ngā otinga whakataruna (1000 ngā whakamātautau).



E ai ki ēnei otinga whakataruna, he aha te whakatau mutunga ka taea e te kaiako?

- (ii) The teacher designed and carried out a simulation to investigate whether the student's results would have been unlikely, given the student did randomly select the 50 secondary schools. For each trial, she randomly selected 50 schools with replacement from the 349 secondary schools, and recorded how many of these 50 schools were Year 9 to 13 schools.

A summary of the simulation results is shown below (1000 trials).

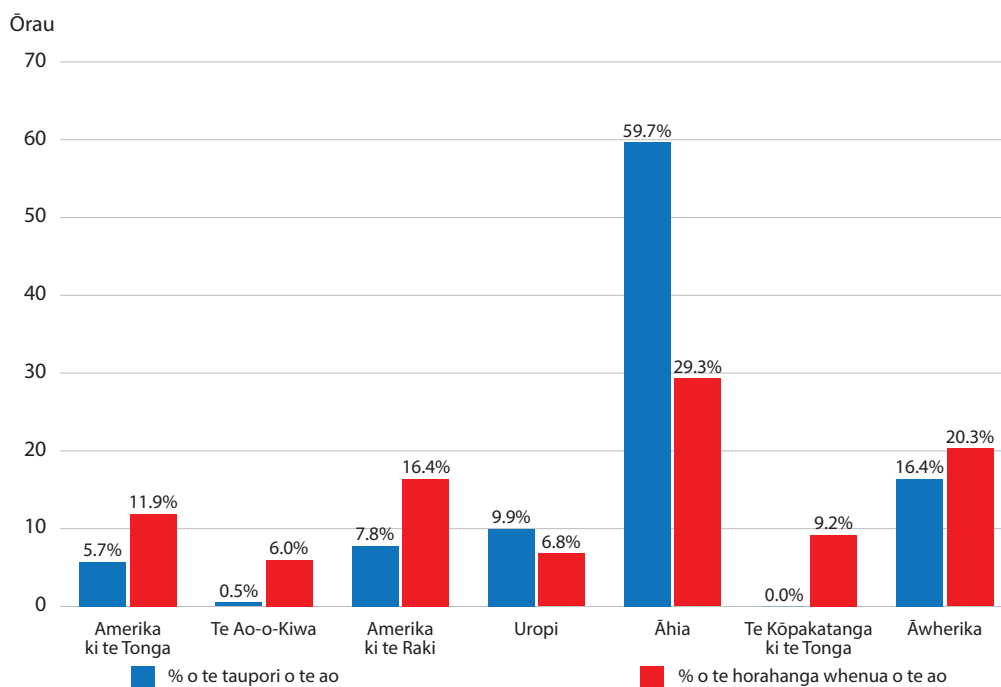


Based on these simulation results, what conclusion could the teacher make?

TŪMAHI TUATORU

I whakamahia ngā whakatau tata a Te Kotahitanga o Ngā Whenua o Te Ao (UN) mō te tau 2018 e ai ki ngā tatauranga whānui ā-motu mai i ngā raraunga hou rawa mō ia whenua ki te hanga i te Kauwhata 1 me te Tūtohi 1 i raro.

Kauwhata 1: Ōrau o te taupori ā-ao me te ōrau o te horahanga whenua o te ao, mā te paparahi



Tūtohi 1: Ōrau o te taupori e noho ana i ngā wāhi tāone me te ōrau o te taupori e noho ana i ngā wāhi tuawhenua, mā te paparahi

Paparahi	% o te taupori e noho ana i ngā wāhi tāone	% o te taupori e noho ana i ngā wāhi tuawhenua
Amerika ki te Tonga	80%	20%
Te Ao-o-Kiwa	69%	31%
Amerika ki te Raki	81%	19%
Uropi	74%	26%
Āhia	49%	51%
Āwherika	41%	59%

- (a) Whakamahia ngā raraunga hei tātai i tētahi whakatau tata mō te ōrau o te taupori o te ao e noho ana i ngā wāhi tāone o Āhia.

(b) Ko te whakaaro hē o tētahi ākonga mēnā e mōhiotia ana kei tētahi wāhi tāone te tangata e noho ana, ko te āhua nei kei Amerika ki te Raki, ki te Tonga rānei taua tangata e noho ana.

(i) Whakamāramahia mai i pēhea te puta o ēnei whakaaro hē o tēnei ākonga.

(ii) E ai ki ēnei raraunga, 54.53% o te taupori o te ao kei ngā wāhi tāone e noho ana.

Tātaihia tētahi whakatau tata mō te tūponotanga e noho ana tētahi tangata i tīpako matapōkeretia i Amerika ki te Raki, ki te Tonga rānei, ina kei tētahi wāhi tāone ia e noho ana.

QUESTION THREE

United Nations estimates for 2018 based on national censuses from the most recent data from each country were used to construct Graph 1 and Table 1 below.

Graph 1: Percentage of the world's population and the percentage of the world's land area, by continent

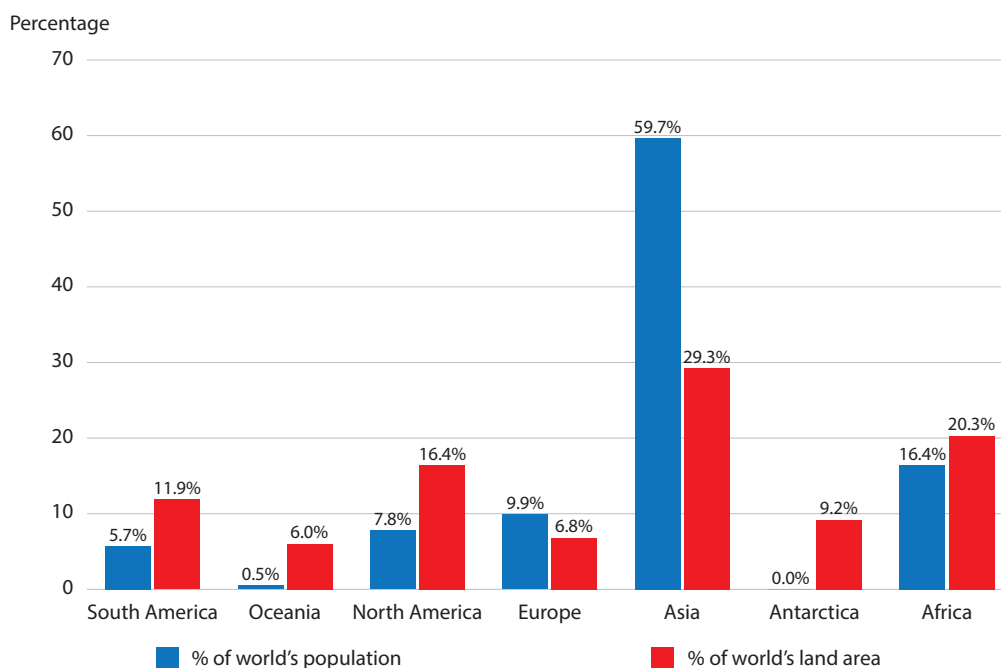


Table 1: Percentage of the population that live in urban areas and the percentage of the population that live in rural areas, by continent

Continent	% of population that live in urban areas	% of population that live in rural areas
South America	80%	20%
Oceania	69%	31%
North America	81%	19%
Europe	74%	26%
Asia	49%	51%
Africa	41%	59%

- (a) Use the data provided to calculate an estimate for the percentage of the world's population that live in an urban area of Asia.

(b) A student incorrectly reasons that if you know that a person lives in an urban area, then it is likely that this person lives in North or South America.

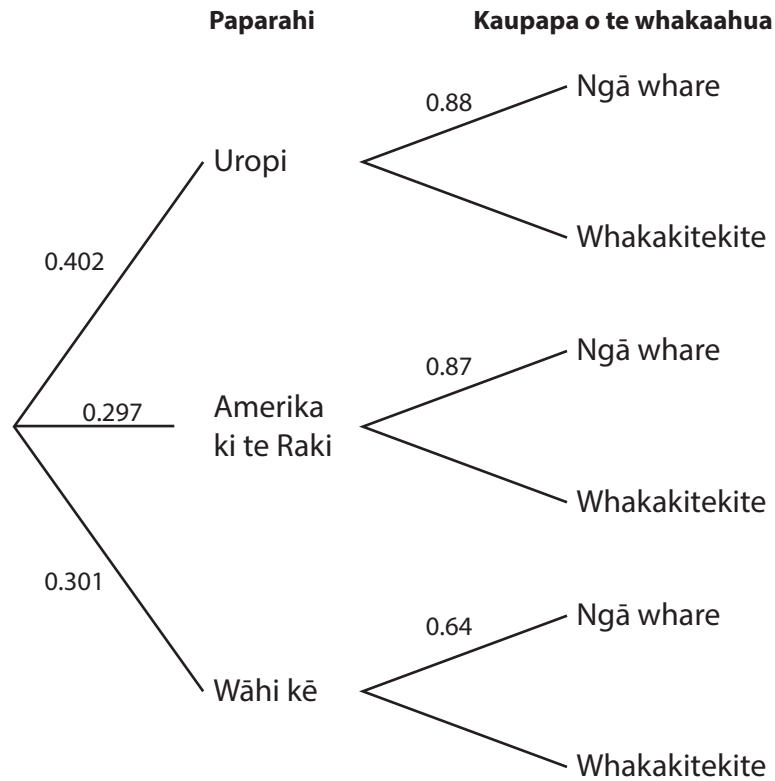
(i) Explain how the student has made this incorrect reasoning.

(ii) Based on this data, 54.53% of the world's population live in urban areas.

Calculate an estimate for the probability that a randomly selected person lives in North or South America, given that they live in an urban area.

- (c) E whakaaturia ana e tētahi paetukutuku ngā whakaahua Google Street View i tūpako matapōkeretia mai i te ao whānui. Ko ngā kaupapa i roto i ēnei whakaahua ka kīia he whakaahua o ngā whare (me ngā nohoanga), ngā whakaahua whakakitekite rānei. Kei roto i ia whakaahua ko te wāhi i tangohia ai te whakaahua.

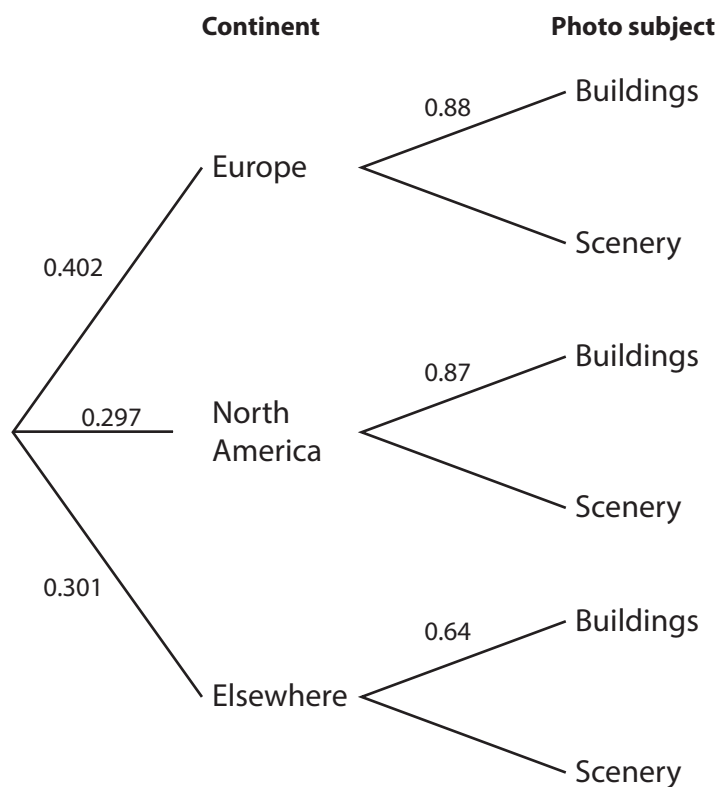
Ko ngā raraunga mai i ngā whakaahua Google Street View maha i whakaaturia e tēnei paetukutuku i whakamahia ki te waihanga i tētahi tauira tūponotanga. He mea whakaatu tēnei tauira hei rākau tūponotanga kāore i oti i raro.



- (i) Whakamāramahia mai nā te wāhi o ngā whakaahua Google Street View kei tēnei paetukutuku me ngā raraunga a te UN kei te Kauwhata 1 i te whārangi 14, e whakaatu ai kāore a Google Street View i te whiwhi whakaahua mai i ngā whenua katoa o te ao.

- (c) A website displays randomly selected Google Street View photos from around the world. The subjects of these photos can be described as either photos of buildings (including houses) or photos of scenery. Each includes the location of where the photo was taken.

Data from a large number of Google Street View photos displayed by this website were used to develop a probability model. This model has been presented as a partially constructed probability tree below.



- (i) Explain how the location of the Google Street View photos displayed by this website and the UN data shown in Graph 1 on page 16, could show that Google Street View does not have photos from all countries in the world.

- (ii) Suppose that a photo displayed on the website is a photo of scenery.

Calculate an estimate for the probability that the location of where the photo was taken is North America.

- (iii) A user of the website displays 50 Google Street View photos and finds that 15 of the photos displayed were taken in Europe.

Use this information, and the information presented earlier in part (c) of this question, to discuss the differences between a true probability, a model estimate, and an experimental estimate.

Support your answer with relevant proportions.

English translation of the wording on the front cover

Level 3 Mathematics and Statistics (Statistics), 2018

91585 Apply probability concepts in solving problems

9.30 a.m. Thursday 22 November 2018
Credits: Four

91585M

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability concepts in solving problems.	Apply probability concepts, using relational thinking, in solving problems.	Apply probability concepts, using extended abstract thinking, in solving problems.

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 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 2–23 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.