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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

2

SUPERVISOR'S USE ONLY

Te Pāngarau me te Tauanga, Kaupae 2, 2018

91267M Te whakahāngai tikanga tūponotanga hei whakaoti rapanga

9.30 i te ata Rāapa 14 Whiringa-ā-rangi 2018
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakahāngai tikanga tūponotanga hei whakaoti rapanga.	Te whakahāngai tikanga tūponotanga mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai tikanga 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.

Tirohia mēnā kei a koe te Puka Tikanga Tātai L2–MATHMF.

Whakaaturia ngā mahinga KATOA.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia te (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

MĀ TE KAIMĀKA ANAKE

Tuhia ai ngā paemahana i ia haora o ia rā i ngā wāhi rerekē puta noa i Aotearoa. Ka tīkina e te Taihoro Nukurangi (NIWA) te "paemahana ā-rā" mā te kimi i te tau toharite o ngā paemahana katoa ka tuhia i roto i te 24 haora i taua wāhi.

(a) I roto i ngā tau e whitu kua taha ake, kua kitea ko ngā paemahana ia-rā i Reefton he tuari māori āwhiwhi me te tau toharite o te 11.6°C, me te ine mahora o te 4.8°C.

Whakamahia tēnei āwhiwhitanga hei whakautu i ngā pātai ki ngā wāhanga (i) ki te (iv).

Me whakaatu rawa ngā mahinga, hoahoa hoki/ranei. Ki te tuhia ko te(ngā) whakautu tika anake ka herea te ākonga ki te taumata Paetae.

(i) Kimihia te tūponotanga ka eke te paemahana ia-rā ki waenga i te 11.6°C me te 18.8°C i Reefton i tētahi rā i tīpako matapōkeretia.

(ii) Kimihia te tūponotanga ka neke atu te paemahana ia-rā i Reefton i te 17°C i tētahi rā i tīpako matapōkeretia.

QUESTION ONE

ASSESSOR'S USE ONLY

Each day, temperatures are recorded every hour at various locations around New Zealand. The National Institute of Water and Atmospheric Research (NIWA) obtains the "daily temperature" by finding the mean of all the recorded temperatures in one 24-hour period at that location.

(a) Over the last seven years, the daily temperatures in Reefton have been found to be approximately normally distributed with a mean of 11.6°C and standard deviation of 4.8°C.

Use this approximation to answer the questions in parts (i) to (iv).

Working and/or diagrams must be shown. Correct answer(s) alone will generally limit grades to Achievement.

(i) Find the probability that a randomly chosen day in Reefton would have a daily temperature between 11.6°C and 18.8°C.

(ii) Find the probability that a randomly chosen day in Reefton would have a daily temperature over 17°C.

(iii) Ko te kōrero a ngā tāngata i Reefton mō ngā rā 1% wera rawa he "tino tahutahu".

He aha te paemahana ia-rā iti rawa o tētahi rā "tino tahutahu"?

MĀ TE KAIMĀKA ANAKE

(iv) Mā te whakamahi i tēnei āwhiwhitanga tuari māori, ko te tūponotanga o tētahi paemahana ia-rā iti ake i te 9°C he 29.4% (3sf).

Me kī i piki ngā paemahana i Reefton nā te huringa āhuarangi, engari ka noho ōrite tonu te ine mahora.

Me eke te paemahana ia-rā toharite mō Reefton ki te aha kia taka iho tēnei tūponotanga ki te 20.0% (3sf)?

ASSESSOR'S USE ONLY

(iii) People in Reefton talk about the hottest 1% of days as being "scorchers".

What is the lowest possible daily temperature of a "scorcher" day?

(iv) Using this normal distribution approximation, the probability of a daily temperature lower than 9°C is 29.4% (3sf).

Suppose that temperatures in Reefton increased due to climate change, but the standard deviation remained the same.

What would the mean daily temperature for Reefton need to become to make this probability fall to 20.0% (3sf)?

(b) Me whakaatu, mō **tētahi** tuari māori, he nui ake te whānuitanga i waenga hauwhātanga (IQR) i te ine mahora i ngā wā katoa.

MĀ TE KAIMĀKA ANAKE

(b) Show that, for **any** normal distribution, the inter-quartile range (IQR) is always greater than the standard deviation.

ASSESSOR'S USE ONLY

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

(a) I tātarihia e Matiu ngā raraunga huarere o ia rā o Kaitāia mai i a NIWA mō ngā tau e whitu kua hipa. I kī ia he rā "hauhau" mēnā i neke atu te hau toharite i te 36 km/h, ā, he "aupaki" i tua atu i tēnei. I kī ia he rā "mākū" mēnā i neke atu i te 2 mm te ua, ā, i tua atu i tēnei he "maroke". I whakarāpopototia e ia ana tātaritanga ki te Tūtohi 1 i raro.

Tūtohi 1

Kaitāia	**Mākū**	**Maroke**	**Tapeke**
Hauhau	553	1093	1646
Aupaki	88	822	910
Tapeke	641	1915	2556

Whakamahia te Tūtohi 1 hei whakautu i ngā pātai kei ngā wāhanga (i) ki te (iii).

(i) He aha te ōwehenga o ngā rā i roto i taua wā he hauhau?

(ii) He aha te ōwehenga o ngā rā mākū i roto i taua wā he aupaki?

(iii) I ēnei tau, ko te tikanga ka mākū i tētahi rā hauhau, ka mākū rānei i tētahi rā aupaki? Tautokona tō tuhinga ki ngā tātainga tūponotanga.

(iv) Kei te whakariterite tētahi kura i Kaitāia i tana Rā Kaipara mō te Huitanguru 2019. Ka whakamahia e te Kaiwhakarite Hākinakina ngā mōhiohio kei te Tūtohi 1 hei tātai i te tūponotanga mēnā he rangi maroke, aupaki hoki taua rā.

MĀ TE KAIMĀKA ANAKE

Homai he take tauanga kotahi e kore pea e puta he tūponotanga tika i te whakamahinga o te Tūtohi 1.

QUESTION TWO

ASSESSOR'S USE ONLY

(a) Matiu analysed Kaitaia's daily weather data from NIWA for the last seven years. He classified a day as "windy" if the mean wind speed was above 36 km/h, and "still" otherwise. He classified a day as "wet" if more than 2 mm of rain fell, and "dry" otherwise. He summarised his analysis in Table 1 below.

Table 1

Kaitaia	Wet	Dry	Total
Windy	553	1093	1646
Still	88	822	910
Total	641	1915	2556

Use Table 1 to answer the questions in parts (i) to (iii).

(i) What proportion of days over this time were windy?

(ii) What proportion of wet days over this time were still?

(iii) Over these years, is it more likely to be wet on a windy day, or wet on a still day? Support your answer with probability calculations.

(iv) A school in Kaitaia is planning its Athletics Day for February 2019. The Sports Co-ordinator uses the information in Table 1 to calculate the probability of the day being dry and still.

ASSESSOR'S USE ONLY

Give one statistical reason why using Table 1 might not lead to a valid probability.

(b) Kei te whakataurite a Matiu i te huarere i Kaitāia ki te huarere i Reefton, kei reira tana tuakana a Tāmati e noho ana. Ka mahia e ia aua tātaritanga anō o ngā raraunga huarere mō ia tāone kia riro mai ai ngā whakarāpopototanga kei ngā Tūtohi 1 me 2 i raro.

MĀ TE KAIMĀKA ANAKE

Tūtohi 1 *(he mea tā anō i te whārangi 8)*

Kaitāia	Mākū	Maroke	Tapeke
Hauhau	553	1093	1646
Aupaki	88	822	910
Tapeke	641	1915	2556

Tūtohi 2

Reefton	Mākū	Maroke	Tapeke
Hauhau	242	53	295
Aupaki	641	1620	2261
Tapeke	883	1673	2556

Ko te whakapae a Matiu he 20 whakareanga ake te tūponotanga ka hauhau ina maroke ana i Kaitāia tēnā i Reefton.

Mā te whakamahi i ngā mōhiohio i ngā Tūtohi 1 me te 2, whakamāramahia mai mēnā kei te tika te whakapae a Matiu, kāore rānei.

ASSESSOR'S USE ONLY

(b) Matiu wants to compare the weather in Kaitaia with the weather in Reefton, where his brother Tamati lives. He performs the same analysis of weather data for each town to obtain the summaries in Tables 1 and 2 below.

Table 1 *(reprinted from page 10)*

Kaitaia	**Wet**	**Dry**	**Total**
Windy	553	1093	1646
Still	88	822	910
Total	641	1915	2556

Table 2

Reefton	**Wet**	**Dry**	**Total**
Windy	242	53	295
Still	641	1620	2261
Total	883	1673	2556

Matiu claims that it is 20 times more likely to be windy when it is dry in Kaitaia than it is in Reefton.

Using the information in Tables 1 and 2, explain whether Matiu's claim is correct or not.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

Ka kitea e Nancy ētahi raraunga mai i NIWA mō te huarere i Hakatere me Te Tihi-o-Maru mai i ngā tau e whitu kua taha ake.

Ka tātarihia e ia ngā raraunga me tana kite:

- I mākū mō te 45% o ngā rā i Hakatere.
- Mēnā i te mākū i Hakatere, ko te tūponotanga i te mākū i taua rā anō i Te Tihi-o-Maru he 63%.
- Mēnā i te maroke i Hakatere, ko te tūponotanga i te maroke i taua rā anō i Te Tihi-o-Maru he 88%.

(a) (i) Kimihia te tūponotanga i te maroke i Hakatere me Te Tihi-o-Maru i tētahi rā i tīpako matapōkeretia.

(ii) Kimihia te tūponotanga, i tētahi rā i tīpako matapōkeretia, kotahi anake te tāone i te mākū.

(iii) Mēnā i te maroke te rā i Te Tihi-o-Maru, he aha te tūponotanga i te maroke anō i Hakatere i taua rā anō?

MĀ TE KAIMĀKA ANAKE

(b) Kei te whakariterite a Nancy i tētahi haere eke pahikara kotahi rā mai i Hakatere ki Te Tihi-o-Maru, ā, ki Waimate hoki. E kī ana te koroua o Nancy, e ai ki tōna mōhio, ko te tūponotanga ka maroke i ngā tāone e toru katoa i te rā kotahi kei "waenga i te takiwā o te 30 ki te 35%".

I te rā i eke pahikara ai a Nancy, i te maroke i Hakatere me Te Tihi-o-Maru.

Mēnā kei te tika te koroua o Nancy, he aha te tūponotanga iti rawa he rā mākū i Waimate?

QUESTION THREE

ASSESSOR'S USE ONLY

Nancy finds some data from NIWA on weather in Ashburton and in Timaru over the past seven years.

She analyses the data and finds that:

- It was wet on 45% of days in Ashburton.
- If it was wet in Ashburton, the probability that it was wet on the same day in Timaru was 63%.
- If it was dry in Ashburton, the probability that it was dry on the same day in Timaru was 88%.

(a) (i) Find the probability that it was dry in both Ashburton and Timaru on a randomly chosen day.

(ii) Find the probability that, on a randomly chosen day, only one of the towns was wet.

ASSESSOR'S USE ONLY

(iii) If it was a dry day in Timaru, what is the probability that it was also dry in Ashburton on the same day?

(b) Nancy is planning a one-day bicycle ride from Ashburton, through Timaru and then to Waimate. Nancy's grandfather says that, in his experience, the probability of it being dry in all three towns on the same day is "somewhere between 30 and 35%".

On the day of Nancy's ride, it is dry in both Ashburton and Timaru.

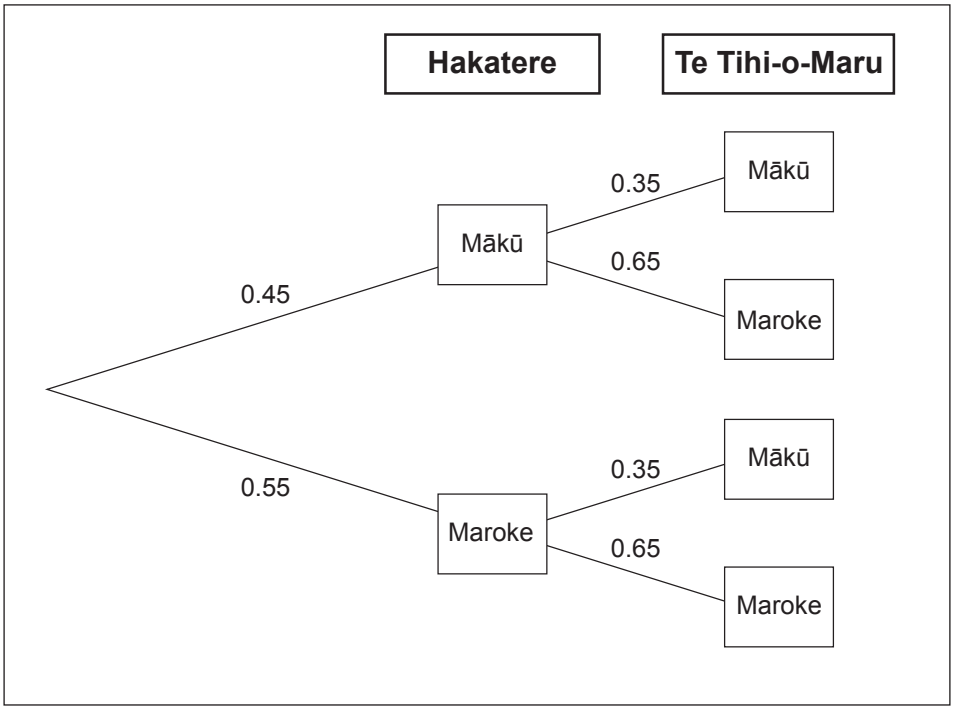
If Nancy's grandfather is correct, what is the smallest probability that it is a wet day in Waimate?

(c) Ka whakamahia e te hoa o Nancy, a Teri, ngā raraunga a NIWA mō ngā tau e whitu kua taha ake, ā ka kitea:

- 45% o ngā rā i Hakatere he mākū
- 35% o ngā rā i Te Tihi-o-Maru he mākū.

Ka hangaia e Teri he hoahoa rākau i te Hoahoa 1 i raro.

Hoahoa 1



Hoahoa 2

He mea urutau i : http://ortho.linz.govt.nz/nz_small_scale/si_1million.jpg

Whakamāramahia te take **kāore** e puta i te hoahoa rākau a Teri tētahi whakautu tika ki te tūponotanga ka maroke i ngā tāone e rua i te rā kotahi.

MĀ TE KAIMĀKA ANAKE

I roto i tō parahautanga, ka taea e koe te:

- whakataurite tō whakautu mai i te wāhanga (a)(i) ki te whakautu ka riro mai i a Teri mai i tana hoahoa rākau
- tirotiro te mahere whenua o Waitaha kei te Tūtohi 2.

He mea urutau ngā raraunga āhuarangi mō tēnei whakamātautau mai i 'CliFlo: NIWA's National Climate Database on the Web', http://cliflo.niwa.co.nz/, i tīkina i te 10 o Whiringa-ā-rangi 2017.

(c) Nancy's friend Teri uses the NIWA data for the past seven years to find out that:

- 45% of days in Ashburton were wet
- 35% of days in Timaru were wet.

Teri constructs the tree diagram in Figure 1 below.

Figure 1

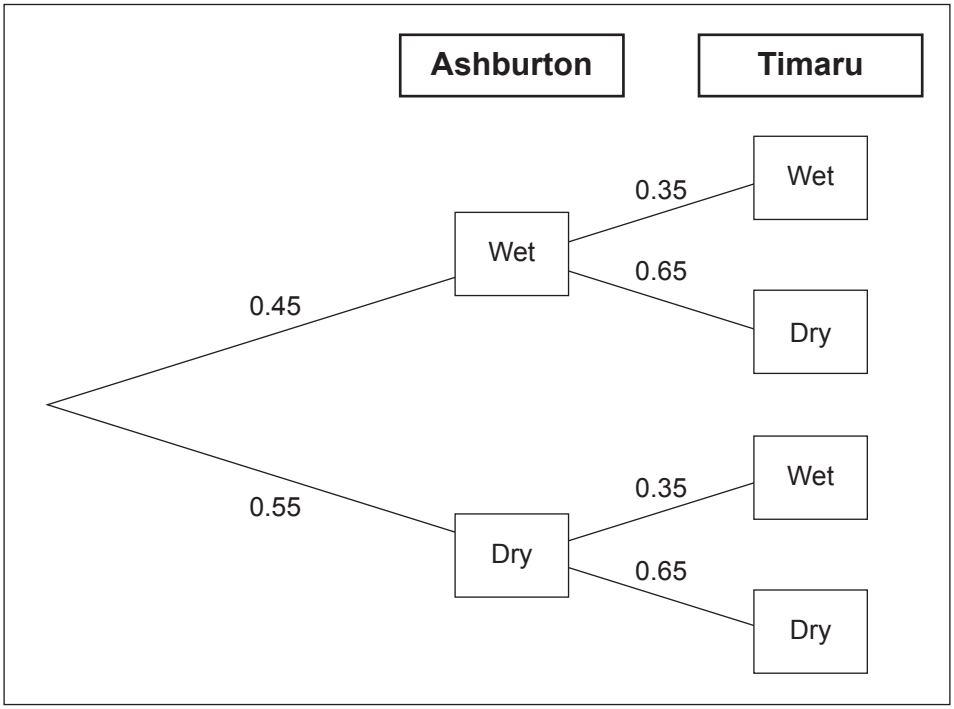


Figure 2

Adapted from: http://ortho.linz.govt.nz/nz_small_scale/si_1million.jpg

Explain why Teri's tree diagram would **not** give a correct answer to the probability that it is dry in both towns on the same day.

As part of your justification, you could:

- compare your answer from part (a)(i) with the answer that Teri would get from her tree diagram
- consult the map of Canterbury in Figure 2.

ASSESSOR'S USE ONLY

Climate data for this examination is adapted from 'CliFlo: NIWA's National Climate Database on the Web', http://cliflo.niwa.co.nz/, retrieved 10 November 2017.

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Mathematics and Statistics, 2018

91267 Apply probability methods in solving problems

9.30 a.m. Wednesday 14 November 2018
Credits: Four

91267M

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability methods in solving problems.	Apply probability methods, using relational thinking, in solving problems.	Apply probability methods, 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.

Make sure that you have Formulae Sheet L2–MATHF.

Show ALL working.

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 2–23 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.