91267M

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SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Te Pāngarau me te Tauanga, Kaupae 2, 2019

91267M Te whakahāngai tikanga tūponotanga hei whakaoti rapanga

9.30 i te ata Rāpare 21 Whiringa-ā-rangi 2019
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 Pukapuka Tikanga Tātai L2–MATHMF.

Whakaaturia ngā mahinga KATOA.

Mēnā ka hiahia whārangi atu anō mō ō tuhinga, whakamahia te wāhi wātea kei muri o tēnei pukapuka.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ka mutu, 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

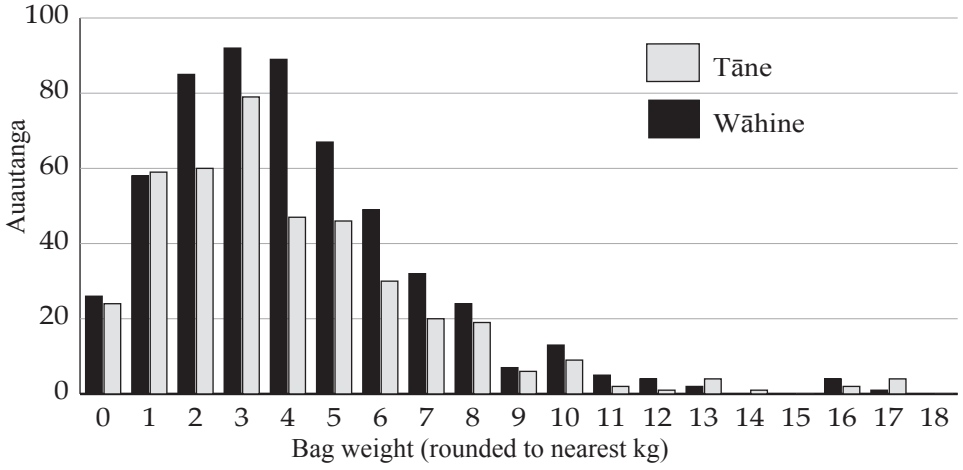
MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

MĀ TE KAIMĀKA ANAKE

Kei te hiahia a Sean ki te mōhio he pēhea te taumaha o te pāhi kura a tētahi ākonga. Mā te whakamahi i tētahi tīpakonga matapōkere o ngā ākonga o Aotearoa, i whiwhi ia i te taumaha o ia pāhi kura a ia ākonga (ki te kg tata rawa). E whakaaturia ana ngā hua o tēnei tūhuratanga ki te Hoahoa 1 me ngā Tūtohi 1 me te 2.

Hoahoa 1: Ngā taumaha o ngā pāhi kura a ētahi ākonga o Aotearoa



Tūtohi 1

Taumaha o te pāhi (kg)	Ngā ākonga wāhine	Ngā ākonga tāne
0	26	24
1	58	59
2	85	60
3	92	79
4	89	47
5	67	46
6	49	30
7	32	20
8	24	19
9	7	6
10	13	9
11	5	2
12	4	1
13	2	4
14	0	1
15	0	0
16	4	2
17	1	4
18	0	0
Tapeke	**558**	**413**

Tūtohi 2

Ngā tatauranga mō te taumaha o te pāhi (kg)	Ngā ākonga wāhine	Ngā ākonga tāne
Toharite	4.1	4.0
Tau Waenga	3.9	3.2

MĀ TE KAIMĀKA ANAKE

(a) Whakamahia te Tūtohi 1 ki te kimi i te tūponotanga ko tētahi ākonga kua tīpakohia matapōkeretia mai i tēnei tīpako:

(i) he taumaha ake tana pāhi kura i te 10 kg.

(ii) he tāne, ā, he 2 kg, iti iho rānei te taumaha o tana pāhi kura.

(b) E kīia ana ko te pāhi "taumaha" he taumaha ake i te 5 kg. E ai ki ngā raraunga a Sean, ka puta te whakapae e whai ake:

"Ko te tikanga he 'taumaha' ake ngā pāhi kura a ngā ākonga wāhine o Aotearoa i ngā pāhi kura a ngā ākonga tāne."

Kei te tautoko ngā raraunga a Sean i tēnei whakapae?

Whakaurua he tātaitai tūponotanga whai pānga tōtika me ētahi atu āhuatanga tauanga hei tautoko i tō tuhinga.

QUESTION ONE

ASSESSOR'S USE ONLY

Sean is interested in how heavy a student's schoolbag is. Using a random sample of New Zealand students, he obtained the weight of each student's schoolbag (to the nearest kg). The results of his investigation are shown below in Figure 1 and in Tables 1 and 2.

Figure 1: Weights of schoolbags of some NZ students

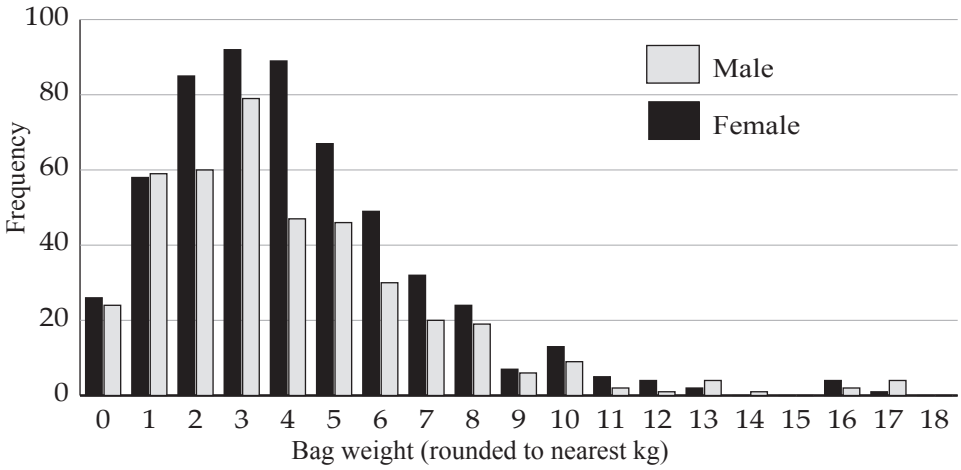


Table 1

Bag weight (kg)	Female students	Male students
0	26	24
1	58	59
2	85	60
3	92	79
4	89	47
5	67	46
6	49	30
7	32	20
8	24	19
9	7	6
10	13	9
11	5	2
12	4	1
13	2	4
14	0	1
15	0	0
16	4	2
17	1	4
18	0	0
Total	**558**	**413**

Table 2

Statistics for bag weight (kg)	Female students	Male students
Mean	4.1	4.0
Median	3.9	3.2

ASSESSOR'S USE ONLY

(a) Use Table 1 to find the probability that a student randomly chosen from this sample:

(i) has a schoolbag weighing more than 10 kg.

(ii) is male and has a schoolbag weighing 2 kg or less.

(b) A "heavy" schoolbag is defined as one that weighs over 5 kg. Based on Sean's data, the following claim is made:

"Female students in New Zealand are more likely to have a 'heavy' schoolbag than male students."

Does Sean's data provide evidence to support this claim?

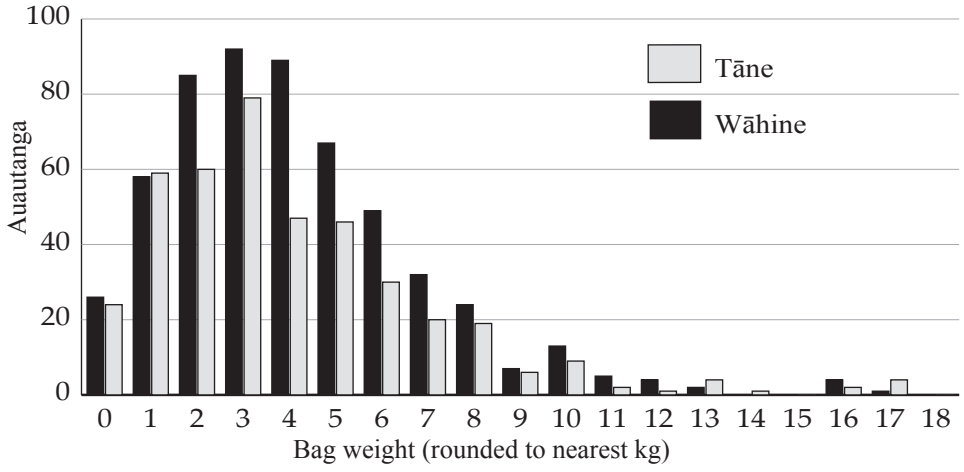
Include an appropriate relative risk calculation and other statistical considerations to support your answer.

(c) I mua i te mahi i tēnei rangahau, ko te tūmanako a Sean he mea tuari māori ngā taumaha pāhi kura.

MĀ TE KAIMĀKA ANAKE

(mai i te whārangi 2)

Hoahoa 1: Ngā taumaha o ngā pāhi kura a ētahi ākonga o Aotearoa



(i) Mā te kōrero mō te āhua o ngā tuari kei te Hoahoa 1, āta whakaahuahia mai he pēhea te rerekē o ēnei tuari mai i tētahi tuari māori.

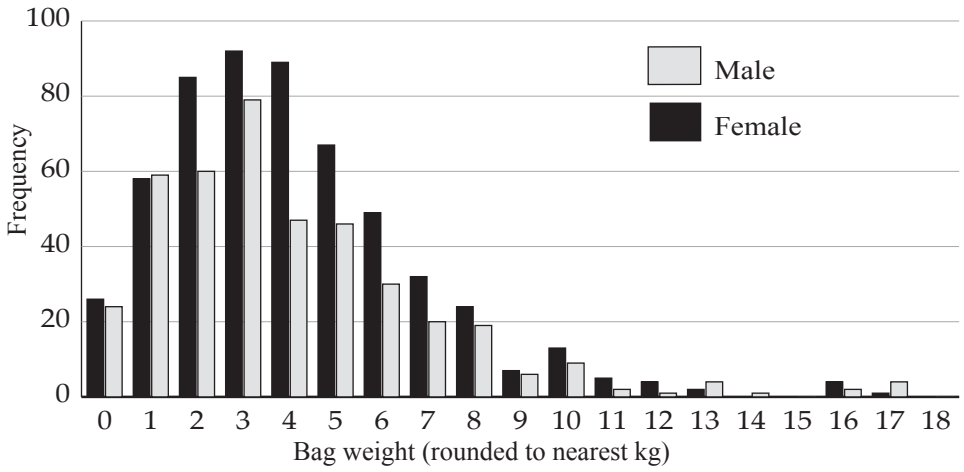
(ii) Homai kia RUA ngā pūtake **kāore pea** e tuari māoritia ngā taumaha o ngā pāhi kūra.

ASSESSOR'S USE ONLY

(c) Before doing this research, Sean expected that the schoolbag weights would be normally distributed.

(repeated from page 4)

Figure 1: Weights of schoolbags of some NZ students



(i) By referring to the shape of the distributions in Figure 1, describe clearly how these distributions are different from a normal distribution.

(ii) Give TWO reasons why it is **unlikely** that the schoolbag weights would be normally distributed.

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

Mahia ā-ringatia ai e tētahi kamupene ngā pereti. Ka taea ngā taumaha o ngā pereti te whakatauira mā tētahi tuari māori me te toharite o te 450 g me tētahi ine mahora o te 35 g.

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

Mātāpuna: http://thehomescene.nz/beautiful-artisan-tableware-for-your-home/

(a) Kimihia te tūponotanga ko te taumaha o tētahi pereti ka tīpakohia matapōkeretia:

(i) kei waenga i te 415 g me te 520 g.

(ii) he iti iho i te 400 g.

(b) Ka ākiritia e te kamupene te 10% o ngā pereti taumaha rawa me te 15% o ngā pereti māmā rawa i hangaia.

He aha te awhe o ngā taumaha ka whakaaetia e te kamupene?

QUESTION TWO

ASSESSOR'S USE ONLY

A company produces hand-made plates.
The weights of the plates can be modelled by a normal distribution with a mean of 450 g and a standard deviation of 35 g.

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

Source: http://thehomescene.nz/beautiful-artisan-tableware-for-your-home/

(a) Find the probability that a randomly selected plate weighs:

(i) between 415 g and 520 g.

(ii) less than 400 g.

(b) The company rejects the heaviest 10% and the lightest 15% of all plates made.

What is the range of weights that the company accepts?

MĀ TE KAIMĀKA ANAKE

(c) Hangaia ai e Tayla ngā pereti i te kamupene. Ko te taumaha toharite hoki o ana pereti he 450 g. Engari ko te ine mahora o ngā taumaha o ngā pereti e mahia ana e Tayla he teitei ake i te ine mahora o ngā taumaha o ngā pereti mō te kamupene whānui.

(i) He aha te mea ka taea te whakatau mai i tēnei mō te āhua o te mahi a Tayla i ana pereti, ina whakatauritea ki te kamupene whānui?

(ii) Mō ngā pereti a Tayla, neke atu i te 75% he taumaha ake i te 400 g.

He aha te **awhe** o ngā uara ka taea o te ine mahora o ngā taumaha o ngā pereti a Tayla?

ASSESSOR'S USE ONLY

(c) Tayla makes plates at the company. Her plates also have a mean weight of 450 g. However, the standard deviation of the weights of the plates Tayla makes is higher than the standard deviation of the weights of plates for the company overall.

(i) What can be deduced from this about the way that Tayla makes her plates, compared with the company overall?

(ii) For Tayla's plates, more than 75% weigh more than 400 g.

What is the **range** of possible values of the standard deviation of the weights of Tayla's plates?

(d) Mahi ai hoki a Eddy i ngā pereti i te kamupene. E rua ana pereti i tīpakohia matapōkeretia, ā, neke atu i 520 g te taumaha o ngā mea e rua.

MĀ TE KAIMĀKA ANAKE

(i) Me kī he ōrite te tuari māori o ngā taumaha o ngā pereti a Eddy ki ngā taumaha o ngā pereti mō te kamupene whānui.

He aha te tūponotanga ko ngā pereti e 2 a Eddy i tīpakohia matapōkeretia he taumaha ake i te 520 g?

(ii) He aha tō whakautu ki te wāhanga (d)(i) mō te tuari ake o ngā taumaha o ngā pereti a Eddy, ina whakatauritea ki te tuari whānui mō te kamupene?

Me mātua whakamahi i ngā tātaitanga tūponotanga hāngai, hoahoa hoki / rānei hei tautoko i tō tuhinga.

ASSESSOR'S USE ONLY

(d) Eddy also makes plates at the company. Two of his plates were randomly selected, and they both weighed over 520 g.

(i) Assume that the weights of Eddy's plates have the same normal distribution as the weights of the plates for the company overall.

What is the probability that 2 randomly selected plates made by Eddy would both weigh over 520 g?

(ii) What could your answer to part (d)(i) suggest about the actual distribution of the weights of Eddy's plates, compared with the overall distribution for the company?

You must support your answer by using relevant probability calculations and / or diagrams.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

I tētahi rā mahi moni i tētahi kura he kēmu mataono kei reira e kīia ana ko te Kēmu A. Ko te tūponotanga o te wikitōria i te Kēmu A he 0.6.

(a) I "Dice-Twice", ka utua e te kaitākaro he 50c ki a Ju-Eun ki te purei, ā, e rua ana tākaro i te Kēmu A.

Mēnā e rua ngā wikitōria a te kaitākaro, ka whiwhi ia i te $2.

Mēnā kotahi anake te wikitōria a te kaitākaro, ka whiwhi ia i te $1.

(i) He aha te tūponotanga ka whiwhi te kaitākaro i te $2?

(ii) He aha te tūponotanga ka whiwhi te kaitākaro i te $1?

(iii) Ka whakarite a Kim ki te purei i a "Dice-Twice" kia 100 ngā wā. Ka kī atu a Ju-Eun ko te "huamoni ki a Kim he $110 tonu".

He aha ngā **hapa** i roto i te tauākī a Ju-Eun?

Tautokona tō tuhinga ki ngā tātaitanga ā-tau.

QUESTION THREE

ASSESSOR'S USE ONLY

At a school fund-raiser there is a dice game called Game A. The probability of winning Game A is 0.6.

(a) In "Dice-Twice", the player pays Ju-Eun 50c to take part, and plays Game A twice.

If the player wins both times, they receive $2.

If the player wins only once, they receive $1.

(i) What is the probability that the player receives $2?

(ii) What is the probability that the player receives $1?

(iii) Kim decides to play "Dice-Twice" 100 times. Ju-Eun says that Kim "will profit by exactly $110".

What are the **errors** in Ju-Eun's statement?

Support your answer with numerical calculations.

(b) Ka hangaia e Tian he kēmu e kīia ana ko "Two-In-Four". I roto i tana kēmu, ka wikitōria te kaitākaro i tētahi taonga mēnā e rua ana wikitōria i te Kēmu A. Ka purei haere tonu te kaitākaro i te Kēmu A kia

- wikitōria ia i ngā kēmu e 2, tērā rānei
- e 4 te tapeke o ngā kēmu kua pureitia.

He aha te tūponotanga o te wikitōria i tētahi taonga i "Two-In-Four"?

MĀ TE KAIMĀKA ANAKE

Ka haere tonu te Tūmahi 3 i te whārangi 18 ➤

ASSESSOR'S USE ONLY

(b) Tian invents a game and calls it "Two-In-Four". In his game, a player wins a prize if they can win twice at Game A. The player can keep playing Game A until

- they have won 2 games, or
- they have played a total of 4 games.

What is the probability of winning a prize in "Two-In-Four"?

Question 3 continues on page 19 ➤

(c) Ka kitea e Xuetao tētahi kēmu rerekē me whai pūkenga nui ake ki te purei. E rua ana tākaro i tēnei kēmu.

- Ki te **wikitōria** ia i te kēmu tuatahi, ko te tūponotanga o tana wikitōria i te kēmu tuarua he **huarua** o te tūponotanga ka wikitōria ia i te kēmu tuatahi.
- Ki te **mīere** ia i te kēmu tuatahi, ko te tūponotanga o tana wikitōria i te kēmu tuarua he **haurua** o te tūponotanga ka wikitōria ia i te kēmu tuatahi.

Ko te tūponotanga ka wikitōria a Xuetao i tētahi kēmu kotahi, iti iho rānei, he 0.75.

He aha te tūponotanga ka mīere ia i ngā kēmu e rua?

MĀ TE KAIMĀKA ANAKE

(c) Xuetao finds a different game that involves more skill. She plays this game twice.

- If she **wins** the first game, her probability of winning the second game is **twice** her probability of winning the first game.
- If she **loses** the first game, her probability of winning the second game is **half** her probability of winning the first game.

The probability that Xuetao wins one game or fewer is 0.75.

What is the probability that she loses both games?

ASSESSOR'S USE ONLY

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

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

Extra space 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, 2019

91267 Apply probability methods in solving problems

9.30 a.m. Thursday 21 November 2019
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 Booklet L2–MATHMF.

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 2–23 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.