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translation of this cover

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91267M



912675

Tuhia he (☒) ki te pouaka mēnā
kāore koe i tuhi kōrero ki tēnei puka



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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pāngarau me te Tauanga, Kaupae 2, 2023

91267M Te whakamahi tikanga tūponotanga i te whakaoti rapanga

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakamahi tikanga tūponotanga i te whakaoti rapanga.	Te whakamahi tikanga tūponotanga i te whakaoti rapanga, mā te whakaaro ā-pānga.	Te whakamahi tikanga tūponotanga i te whakaoti rapanga, mā te whakaaro waitara e whānui ana.

Tirohia kia kitea ai 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.

Whakaaturia ngā whiriwhiringa KATOA.

Tirohia kia kitea ai kei a koe te Pepa Ture Tātai L2–MATHF.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–27, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (Ae Rūhū Tei / Kōwhiri Tūmahi). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

HOATU TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TE TŪMAHI TUATAHI

E pai ana a Alex ki te kēmu maikuku i te whare rēhia.

Ka tau te mōhio ki a ia kua aunoa kē te mahi a ngā mīhini, arā, kāore e whakahaerehia i runga i ngā pūkenga o te kaiwhakamahi.

Anei ngā whakaritenga e toru o tētahi kēmu maikuku ka tākarohia e Alex:

- I te 15% o ngā kēmu, ka hīkina e te maikuku tētahi taonga tākaro, engari ka ‘taka’ anō i te maikuku.
- I ērā atu o ngā whakamātautanga, tōna 1 o ngā kēmu 10 ka kōwhiria kia toa mā te whakaputa a te mīhini i te tau matapōkere. Nā konei, ko te tūponotanga o te toanga i te kēmu tuatahi, ko te 1/10.
- Ki te kore e toa i tētahi kēmu, ka rerekē te tūponotanga o ngā kēmu i muri mai, i te heke haeretanga o ngā tau matapōkere e toe ana, arā, ko te tūponotanga o te toanga o te kēmu tuarua, ko te 1/9, ā, ka pēnei te haere.

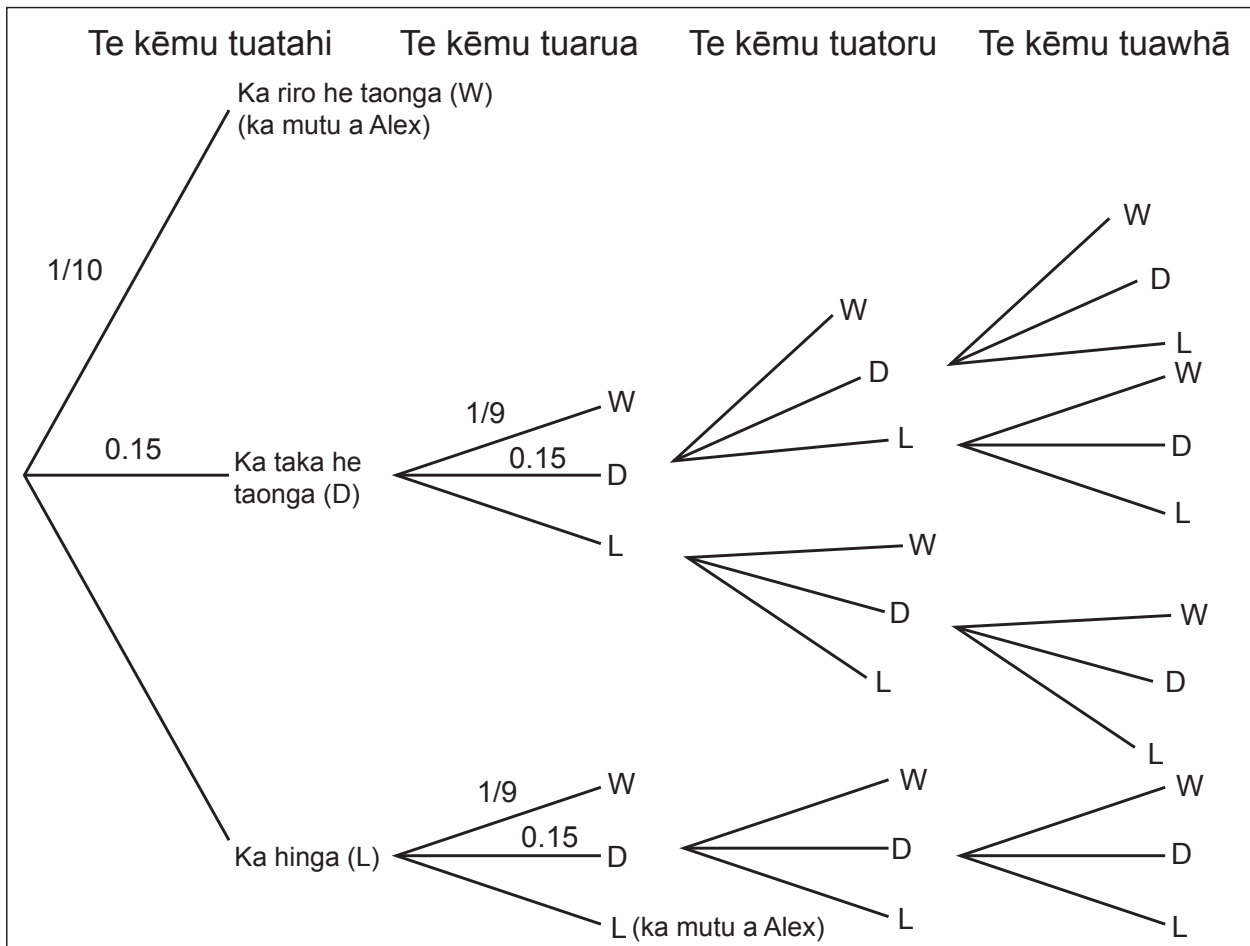
I tētahi rā, ka mātaki a Alex i te rironga o tētahi taonga tākaro i tētahi, kātahi ia ka tākaro i te kēmu maikuku me tēnei rautaki:

- Ki te riro i a ia tētahi taonga tākaro, ka mutu tana tākaro.
 - Ki te ‘taka’ i te maikuku te taonga tākaro, ka whakamātau anō ia.
 - Ka tākaro tonu ia tae noa ki te wā kua rua ana hinganga (me te kore i taka o te taonga), kua eke rānei te tapeke o ana kēmu ki te 4.
- (a) Whakaotihia te hoahoa-peka kei raro nei, ā, whakamahia hei whakautu i ngā pātai i te whārangi e whai ake nei.



Te mātāpuna: www.istockphoto.com/photo/claw-vending-machine-gm497990062-79428151

Te Ata 1



(i) He aha te tūponotanga ka 'taka' i te maikuku te taonga i te kēmu tuatahi, ā, ka toa a Alex i te kēmu tuarua ka tākarohia e ia?

(ii) He aha te tūponotanga ka toa a Alex i te kēmu tuatoru ka tākarohia e ia?

(iii) He aha te tūponotanga ka toa a Alex i te kēmu maikuku i mua i te paunga o ngā whakamātautanga kāore e neke atu i te whā?

QUESTION ONE

Alex likes playing the claw game at the arcade.

She finds out that the machines are programmed and are not based on the skill of the user.

A particular claw game that Alex plays has these settings:

- In 15% of games, the claw picks up a toy, but ‘drops’ it again.
- Out of the other attempts, about 1 in 10 games will be selected to be won by the machine generating a random number. This means the probability the first game is won is $1/10$.
- If a game is not won, then the probability of the subsequent games will change as the remaining random numbers decrease, i.e. the probability of the second game being won is $1/9$, and so on.



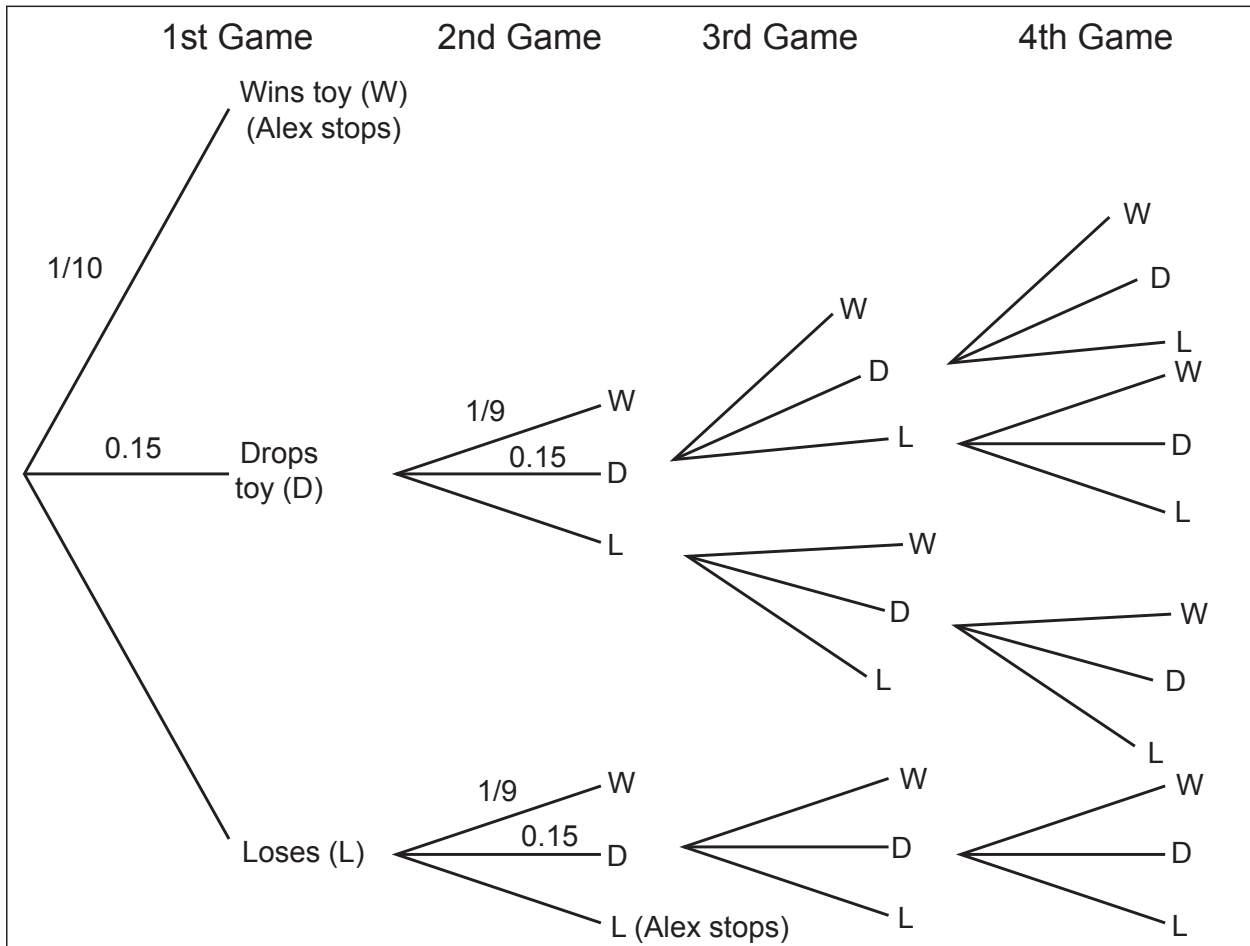
Source: www.istockphoto.com/photo/claw-vending-machine-gm497990062-79428151

One day Alex watches someone else win a toy, and then she plays the claw game with this strategy:

- If she wins a toy, she stops.
- If the claw ‘drops’ the toy, she always tries again.
- She keeps playing until she has had two losses (without it dropping) or a maximum of 4 games in total.

(a) Complete the tree below and use it to answer the questions on the next page.

Figure 1



(b) Ka haere ana a Alex ki te whare rēhia, i te 70% o ngā haerenga, ka haere ia i te taha o ana hoa.

Ki te haere ia i te taha o ana hoa, kotahi anake tana tākaro i te ‘maikuku’, ā, ka toa ia i te 10% o aua toronga.

Ki te haere ia i tana kotahi, ka tākaro ia i ngā kēmu maha, ā, ka toa ia i tōna ¼ o aua toronga.

He wāhi mō te hoahoa-peka tūponotanga

- (b) When Alex goes to the arcade, 70% of the time she goes with her friends.

If she goes with her friends, she plays the ‘claw’ just once, and wins on 10% of these visits.

If she is by herself, she plays multiple games and wins on about $\frac{1}{4}$ of these visits.

Space for probability tree

(i) I runga i ērā āhuatanga, he aha te tūponotanga o te toanga o Alex i te kēmu ‘maikuku’ i ana toronga ki te whare rēhia?

(ii) I muri i tana tākaro i te whare rēhia, he rite tonu tā Alex haere ki te wharekai ki te kai horotai.

- Mēnā i hinga a Alex i te kēmu ‘maikuku’, engari kei te taha ia o ana hoa, e toru whakareanga te nui ake o tana tūpono hoko i tētahi horotai i te wharekai, tēnā i tana noho i tana kotahi.
- Ki te toa a Alex i te kēmu ‘maikuku’, e rua whakareanga te nui ake o tana tūpono hoko i tētahi horotai i te wharekai, tēnā i tana hinga i te kēmu ‘maikuku’, ahakoa kei tōna taha ōna hoa, kāore rānei.
- Ko te tapeke o te tūponotanga o tā Alex hoko i tētahi horotai i te wharekai, ko te 40%.

Whiriwhiria te tūponotanga o tēnei tūāhua: i tētahi toronga matapōkere ki te whare rēhia i te taha o ana hoa, ka toa a Alex i te kēmu ‘maikuku’, ā, ka hokona e ia tētahi horotai i te wharekai.

(i) Overall, what is the probability of Alex winning the ‘claw’ game on her visits to the arcade?

(ii) After playing at the arcade, Alex often goes to the café for a treat.

- If Alex lost the ‘claw’ game, but is with her friends, she is three times more likely to buy a treat from the café than if she was by herself.
- If Alex wins the ‘claw’ game, she is twice as likely to buy a treat from the café than if she loses the ‘claw’ game, whether she is with her friends or not.
- The probability that Alex buys a treat at the café overall is 40%.

Find the probability that, on a random visit to the arcade with her friends, Alex wins the ‘claw’ game and buys a treat from the café.

TE TŪMAHI TUARUA

Whakaotihia ai e Irirangi Te Motu tētahi rangahau mō te whakamahinga o ngā ara pāpāho i Aotearoa.

(a) I pūrongotia ngā hua e whai ake nei i te rangahau o te tau 2021.

- I uia te hunga whai wāhi 1420 mēnā i roa ake i te 5 meneti te mātakina e rātou o tēnā me tēnā o ngā momo pāpāho i te rā i mua i te uiui.
- I wehea ngā raraunga ki ngā rangatahi o Aotearoa (15–24 te pakeke) me ngā tāngata o Aotearoa e 25 te pakeke, e pakeke ake ana rānei i tērā.

Te Tūtohi 1: Ngā whakamahinga pāpāho a te rangatahi o Aotearoa (15–24 te pakeke) me ngā pakeke (E 25+ te pakeke) i te tau 2021

Te momo pāpāho		Ngā rangatahi o Aotearoa 15–24	Ngā pakeke o Aotearoa e 25+	Te tapeke
Ngā kiriata ā-ipurangi	Āe	228	610	838
	Kāo	23	559	582
	Te tapeke	251	1169	1420
Ngā ratonga pāho tikinoa	Āe	191	533	724
	Kāo	60	636	696
	Te tapeke	251	1169	1420
Te pouaka whakaata	Ā	90	705	795
	Kāo	161	464	625
	Te tapeke	251	1169	1420

Te mātāpuna: www.nzonair.govt.nz/research

- (i) Whiriwhiria te tūponotanga o tēnei tūāhua: he rangatahi nō Aotearoa te tangata whai wāhi ki te rangahau i matapōkere te kōwhiria, nāna i mātaki tētahi ratonga pāho tikinoa i te rā i mua mai.

- (ii) Ka titiro a Tao ki te tūtohi o runga, ka mea, “tokomaha ake ngā pakeke (e 25+ te pakeke) ka mātaki i ngā kiriata ā-ipurangi, tēnā i ngā rangatahi (15–24 te pakeke), nā reira, he nui ake te tūponotanga o tā te pakeke i Aotearoa mātaki i ngā kiriata ā-ipurangi, tēnā i tā te rangatahi.”

Kei te tika tāna?

Parahautia tō whakautu mā te whakamahi tātainga hei tautoko i ō whakaaro.

QUESTION TWO

A survey of New Zealand media usage is completed regularly by NZ on Air.

- (a) The following results were reported from the 2021 survey.
- 1420 participants were asked if they had watched each of the media types the day before for at least 5 minutes.
 - The data was split between New Zealand youth (aged 15–24) and New Zealanders aged 25 years and older.

Table 1: Media usages of New Zealand youth (15–24) and adults (25+) in 2021

Media type		NZ Youth 15–24	NZ adults 25+	Total
Online video	Y	228	610	838
	N	23	559	582
	Total	251	1169	1420
Streaming services	Y	191	533	724
	N	60	636	696
	Total	251	1169	1420
TV	Y	90	705	795
	N	161	464	625
	Total	251	1169	1420

Source: www.nzonair.govt.nz/research

- (i) Find the probability that a randomly chosen survey participant is a New Zealand youth who watched a streaming service the day before.

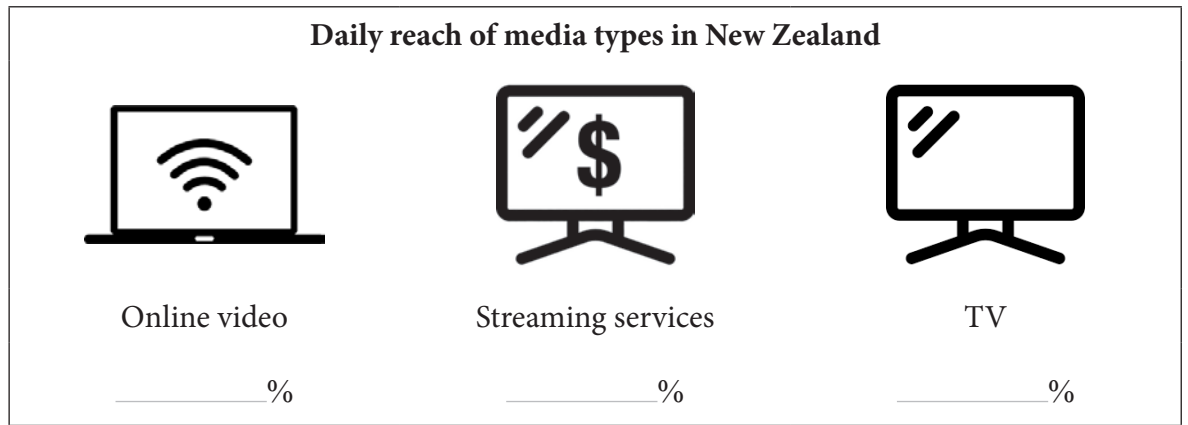
- (ii) Tao looks at the table above, and says that “more adults (25+) watch online videos than youth (15–24), so this means adults in New Zealand are more likely to watch online videos than youth.”

Is he correct?

Justify your answer using calculations to support your reasoning.

- (iii) The report wants to include an infographic showing the “daily reach” (percent usage) of various types of media.

Find the overall percentage of New Zealanders using each of the three media types given, according to the survey results.



- (iv) The report claims that “New Zealand youth are about 70% more likely to watch streaming services, but over 40% less likely to watch TV, than New Zealanders aged 25 and over”.

Evaluate this claim using appropriate calculations.

- (b) E whakaatuhia ana i raro nei ngā hua o ngā rangahau e whā e āhua rite ana mō te whakamahinga pāpāho, i whakahaerehia ai i ngā tau rerekē.

Te Tūtohi 2: Te rangatahi o Aotearoa (15–24 te pakeke) e mātaki ana i ngā ratonga pāho tikinoa i ia rā

		2016		2020	2021	2022
E mātaki ana i ngā ratonga pāho tikinoa i ia rā	Āe	102		181	191	473
	Kāo	147		81	60	233
	Te tapeke	249		262	251	706

- (i) Kua pēhea te nui ake o te ōrau o te rangatahi o Aotearoa e mātaki ana i ngā ratonga pāho tikinoa i te tau 2022, tēnā i tō te tau 2016?

- (ii) Mēnā i rangahaua ngā rangatahi e 400 i te tau 2023, ko tōna tokohia ka mātaki i ngā ratonga pāho tikinoa, ki tāu nā whakapae?

Parahautia tō whakautu i runga i tētahi, i ētahi rānei o ngā tātainga nō te tūtohi o runga ake nei.

- (b) The results of four similar surveys about media usage conducted in different years are shown below.

Table 2: New Zealand youth (aged 15–24) watching streaming services daily

		2016		2020	2021	2022
Watch streaming services daily	Y	102		181	191	473
	N	147		81	60	233
	Total	249		262	251	706

- (i) How much higher is the percentage of New Zealand youth who watch streaming services in 2022 than it was in 2016?

- (ii) If 400 youth were surveyed in 2023, approximately how many would you expect to watch streaming services?

Justify your answer based on at least one calculation from the table above.

TE TŪMAHI TUATORU

I pūrongoia i tētahi mātaihanga o nā tata nei, 113 meneti te toharite o te wā i ia rā ka pau i te rangatahi o Aotearoa (15-24 tau te pakeke) e mātaki ana i ngā **ratonga pāho tikinoa**.

(a) Me kī, e whai ana te tuari o ngā meneti e mātakihia ana ngā ratonga pāho tikinoa i ia rā i te tuari māori, ā, e 35 meneti i te rā te ine mahora.

(i) Whiriwhiria te tūponotanga o tēnei tūāhua: kāore e eke ki te 92 meneti i te rā te roa o tā tētahi rangatahi o Aotearoa, i kōwhiri matapōkeretia ai, tāna mātaki i ngā **ratonga pāho tikinoa**.

(ii) Whiriwhiria te tūponotanga o tēnei tūāhua: kei waenga i te rua me te toru haora te roa o tā tētahi rangatahi o Aotearoa mātaki i ngā **ratonga pāho tikinoa** i ia rā.

QUESTION THREE

A recent study reported that New Zealand youth (aged 15–24) spend an average (mean) of 113 minutes per day watching **streaming services**.

- (a) Assume the distribution of minutes watching streaming services per day follows a normal distribution, with a standard deviation of 35 minutes per day.
- (i) Find the probability that a randomly selected New Zealand youth spends under 92 minutes a day watching **streaming services**.

- (ii) Find the probability that a New Zealand youth spends between two and three hours watching **streaming services** daily.

- (b) In the same study, New Zealand youth were reported to watch **online videos** for 94 minutes daily on average, with a standard deviation of 30 minutes.
 - (i) Find the interquartile range (middle 50%) for the number of minutes that New Zealand youth reportedly spend watching **online videos**.

- (ii) Out of a group of 50 New Zealand youth, how many more respondents would you expect to have spent over 2 hours (120 minutes) watching **streaming services** than **online videos**?

(iii) Homai kia kua e iti iho i ngā take e RUA, e kore ai pea e tika te tuari māori i ēnei horopaki, i te nui o ngā meneti e mātakihia ana ngā **ratonga pāho tikinoa** me ngā **kiriata ā-ipurangi**, mō ngā rangatahi katoa o Aotearoa.

Ka hiahia pea koe ki te whakauru i tētahi huahua o te tuari tūturu kē o tētahi o aua horopaki, ki tāu whakapae ka tika ake, hei tautoko i tō tuinga.

Te take 1: _____

Te take 2: _____

(c) I te mātaitanga, i pūrongoia, e 34 meneti noa iho te tapeke o te toharite o te roa o tā te rangatahi o Aotearoa mātaki i te **pouaka whakaata**. Heoi, ki te kore e whai wāhi mai ērā kāore i paku mātaki i te **pouaka whakaata**, ko te 114 meneti kē i ia rā te toharite.

(i) Whakamāramatia te pānga o te whakaurunga o ngā rangatahi kāore i paku mātaki i te **pouaka whakaata** ki te toharite me te tuari o ngā meneti e mātakihia ana te **pouaka whakaata** e te rangatahi o Aotearoa.



- (iii) Give at least TWO reasons why a normal distribution may not be appropriate in these contexts of the number of minutes spent watching **streaming services** and **online videos** for all New Zealand youth.

You may want to include a sketch of what you expect the real distribution of one of these contexts would look like, to support your answer.

Reason 1: _____

Reason 2: _____

- (c) In the study, it was also reported that overall, New Zealand youth watched a daily average of only 34 minutes of **TV**. However, when excluding those who didn't watch **TV** at all, the average was 114 minutes daily.
- (i) Explain the effect of including the youth who did not watch **TV** at all, on the mean and distribution of minutes of watching **TV** by New Zealand youth.

(ii) Me kī, ka whakatauirā tētahi tuari māori i te nui o ngā meneti e mātaki ai te rangatahi o Aotearoa i te **pouaka whakaata** i ia rā, ko te 114 meneti te toharite (kāore e uru ki tēnei tapeke te hunga kāore e mātaki pouaka whakaata).

Mēnā ka neke atu i te 150 meneti i ia rā te roa o te mātaki **pouaka whakaata** a te 12% o te rangatahi o Aotearoa ka mātaki pouaka whakaata, tātaihia te ine mahora o ngā meneti i ia rā ka pau i te mātaki **pouaka whakaata**.

- (ii) Assume a normal distribution models the number of minutes New Zealand youth spend watching TV daily with a mean of 114 minutes (excluding non-TV watchers).

If 12% of New Zealand youth who do watch TV, watch more than 150 minutes daily, calculate the standard deviation of daily minutes spent watching TV.

English translation of the wording on the front cover

Level 2 Mathematics and Statistics 2023

91267M Apply probability methods in solving problems

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.

Show ALL working.

Make sure that you have the Formulae Sheet L2–MATHF.

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 2–27 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.