

SUPERVISOR'S USE ONLY

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Tirohia te uhi o muri e kitea ai te
whakapākehātanga o tēnei uhi

91267M



Tuhia he (X) 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, 2025

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 whai i te whakaaro ā-pānga.	Te whakamahi tikanga tūponotanga i te whakaoti rapanga, mā te whai i 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 Puka Ture Tātai L2–MATHMF.

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 ngā paenga (⚡/⚡/⚡). Ka poroa aua wāhanga ka mākahia ana te pukapuka.

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

TE TŪMAHI TUATAHI

Kua kitea i ngā rangahau, he pai ake ki ngā tāngata o Aotearoa te parakuihi i ngā wharekai, tēnā i te kāinga. Ko tētahi kai e paingia ana i te rārangi parakuihi, ko ngā māwhena.

- (a) I tētahi wharekai o te rohe pātata, ko YARAS te ingoa, ka takaina ngā māwhena he 118 g te taumata toharite, me te ine mahora o te 19 g. Me kī, ka taea te taumaha o ngā māwhena te whakatauiria, i runga i te āwhiwhi, mā te tuari māori.
- (i) Whiriwhiria te tūponotanga e taumaha ake ai tētahi māwhena ka kōwhiria matapōkeretia i te 100 g.

- (ii) E hia te ōrau o ngā māwhena kei waenganui i te 100 g me te 120 g te taumaha?

- (iii) 10% o ngā māwhena kei raro iho i te taumaha mōkito e whakaaetia ana, ā, kāore e āhei te hokona atu.

E hia te taumaha mōrahi o tētahi māwhena kāore e āhei te hokona atu?

QUESTION ONE

Research has shown that people in New Zealand prefer having breakfast at cafes to having it at home. One popular item on the breakfast menu is muffins.

- (a) A local cafe, YARAS, makes muffins that have a mean weight of 118 g and a standard deviation of 19 g. Assume that the weights of the muffins can be approximately modelled by a normal distribution.

- (i) Find the probability that a randomly chosen muffin weighs more than 100 g.

- (ii) What percentage of muffins weigh between 100 g and 120 g?

- (iii) 10% of muffins are below the minimum weight requirement and cannot be sold.

What is the maximum weight of a muffin that cannot be sold?

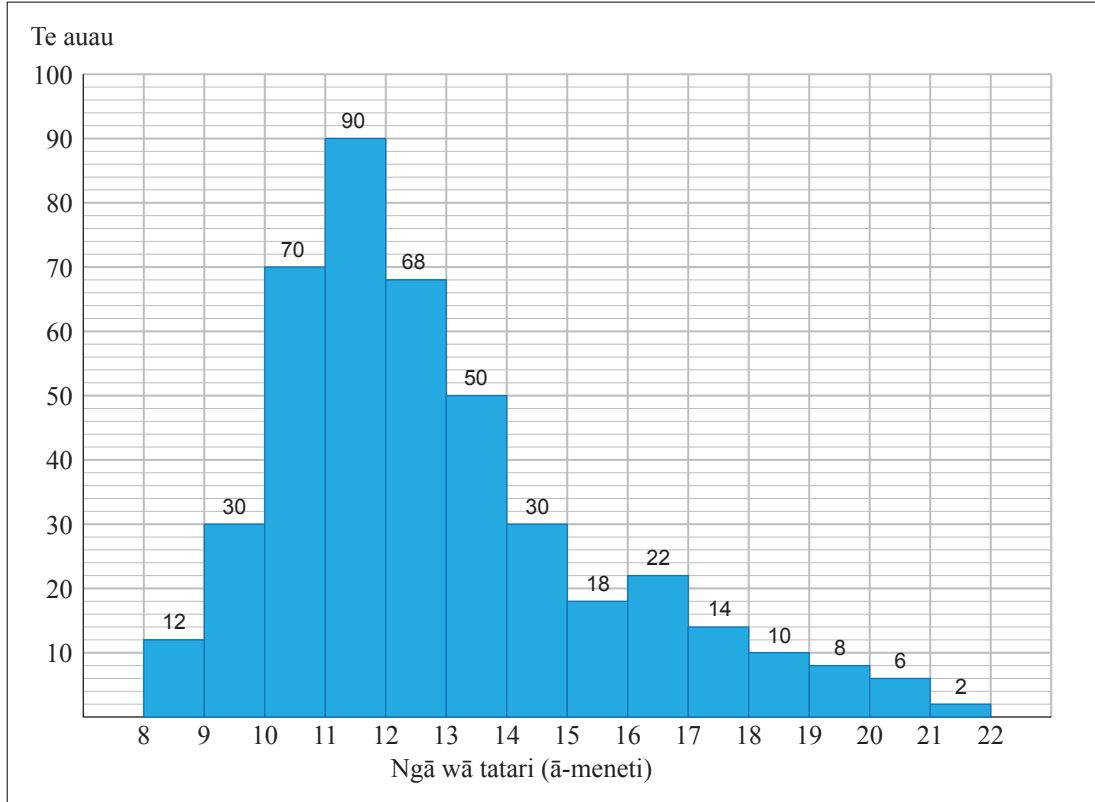
- Tātaia tētahi ine mahora hou mō te taumaha o ngā māwhena, e kore ai e neke atu i te 2% o ngā māwhena ka iti iho i te 100 g te taumaha.

- Calculate a new standard deviation for the muffin weights that would ensure no more than 2% of the muffins weigh less than 100 g.

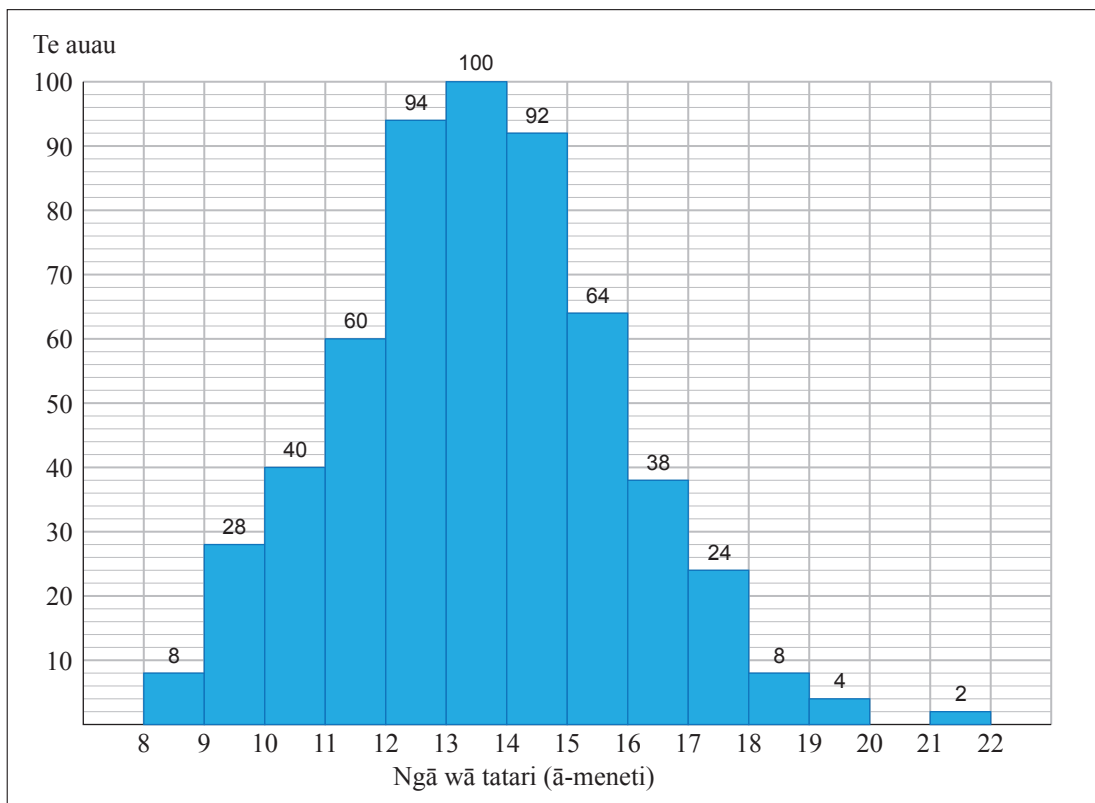
- (c) Ki YARAS, me tatari ngā kiritaki kia takaina ā rātou parakuihi i muri i te tukunga o ā rātou tonu.

E whakaaturia ana i ngā kauwhata o raro nei te roa ā-meneti i tatari ai ngā kiritaki kia rite mai ā rātou parakuihi i tētahi Hatarei me tētahi Hanarei, i tētahi mutunga wiki.

Ngā wā tatari ki te parakuihi i te Hatarei



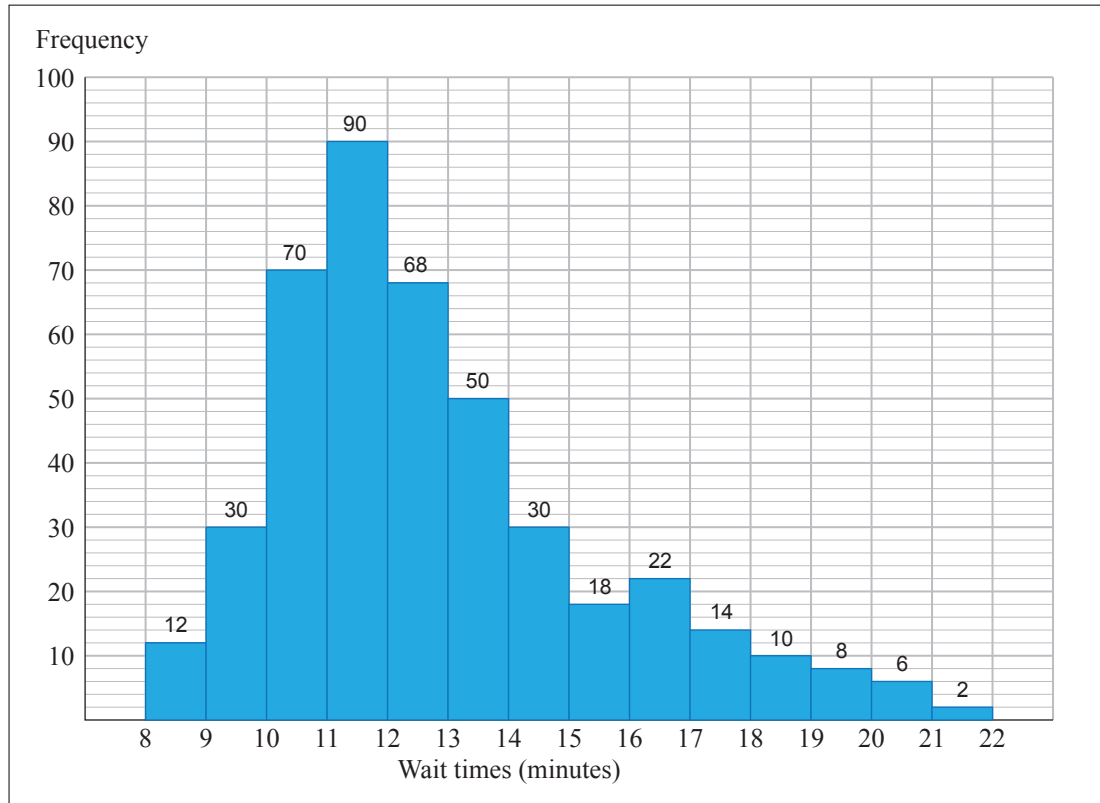
Ngā wā tatari ki te parakuihi i te Hanarei



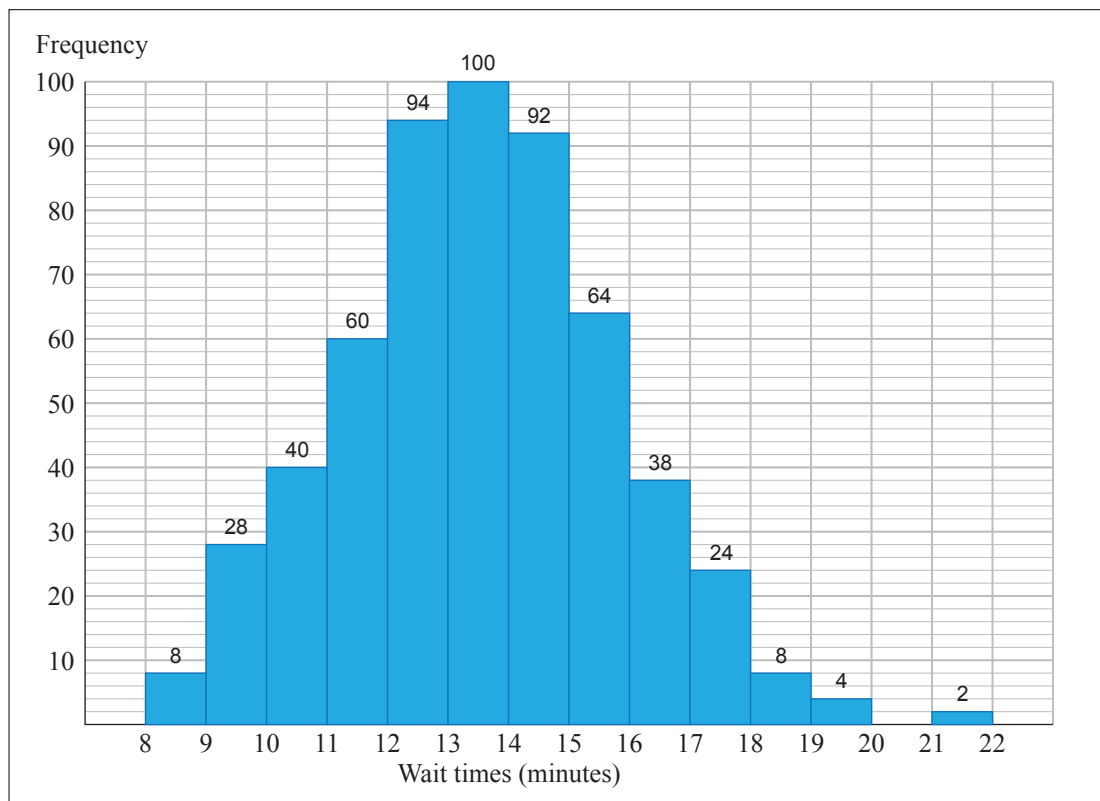
- (c) At YARAS, customers have to wait for their breakfasts to be prepared after their orders are placed.

The graphs below show the time in minutes that customers had to wait for their breakfast to arrive on a Saturday and Sunday during one weekend.

Saturday wait times for breakfast



Sunday wait times for breakfast



- Use the graph to calculate the probability to support or reject this claim.

- You should discuss shape, centre, and spread in relation to the context.

TE TŪMAHI TUARUA

(a) I whakahaeretia hoki e YARAS tētahi rangahau e whakatauria ai ko ēhea ngā kōwhiringa parakuihi i pai katoa ki ā rātou kiritaki. Ko ā rātou kōwhiringa matua, ko te mūrihi rānei, ko ngā panekeke rānei, ko te pēkana me te hēki rānei. Kātahi rātou ka wātea ki te whiriwhiri i te huarākau rānei, i te waipupuru rānei.

- I kōwhiri te 25% o ngā kiritaki i te mūrihi, e 30% i kōwhiri panekeke, ā, ko ērā atu i kōwhiri i te pēkana me te hēki.
- I pai ake ki te $\frac{2}{5}$ o ngā kiritaki ngā huarākau hei kīnaki i ā rātou mūrihi.
- I pai ake ki te 18% te waipupuru hei kīnaki i ā rātou panekeke.
- He ōrite te tūpono ka kōwhiria e ngā kiritaki, i kōwhiri rā i te pēkana me te hēki, te huarākau rānei, te waipupuru rānei hei kīnaki i ā rātou parakuihi.

Tāia tētahi rākau tūponotanga, ka whakamahi ai hei whakaoti i ngā wāhanga o raro iho nei.

(i) He aha te tūponotanga ka kōwhiria e tētahi kiritaki ngā panekeke me te huarākau hei parakuihi?

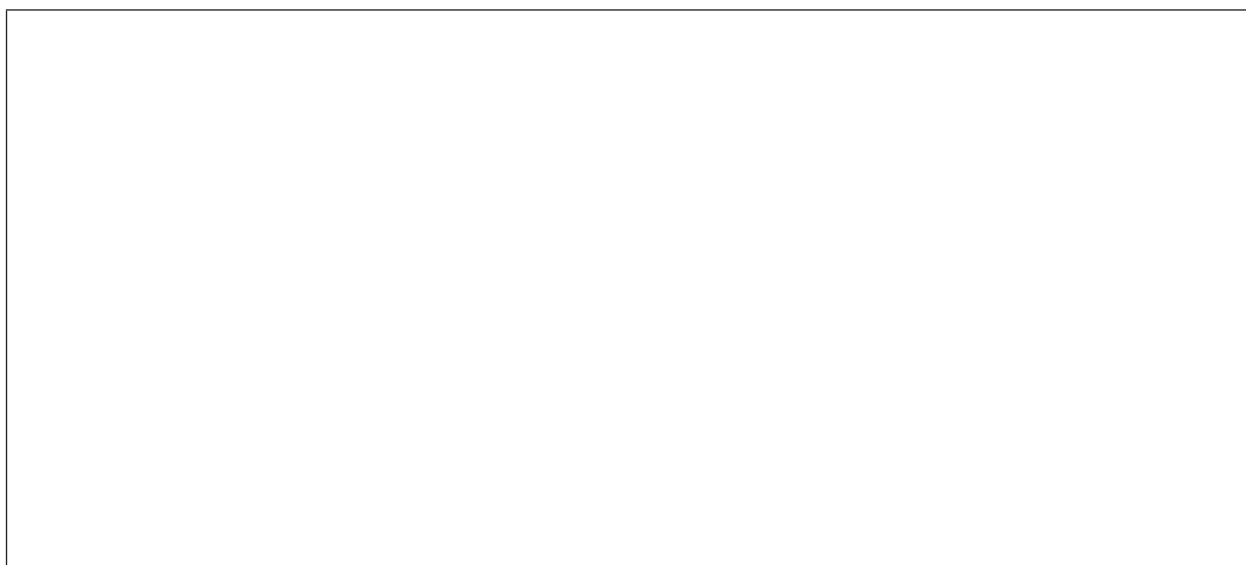
(ii) O roto i tētahi rōpū e 250 ngā kiritaki, i kōwhiria matapōkeretia ai, tokohia ngā kiritaki ka kōwhiri i te waipupuru, ki tō matapae?

QUESTION TWO

- (a) YARAS also did a survey to determine which breakfast options were preferred by their customers. Their main choices were muesli, pancakes, or bacon & eggs. They then had a choice of fresh fruit or yoghurt.

- 25% of customers chose muesli, 30% chose pancakes, and the rest chose bacon & eggs.
- $\frac{2}{5}$ of the customers preferred fruit with their muesli.
- 18% preferred yoghurt with their pancakes.
- Customers who chose bacon & eggs were equally likely to choose the fruit or yoghurt with their breakfast.

Draw a probability tree and use it to answer the parts below.



- (i) What is the probability that a customer chooses pancakes and fruit for breakfast?

- (ii) For a randomly selected group of 250 customers, how many customers would you expect to choose yoghurt?

(b) E whakahaerehia ana tētahi whakatairanga pirihonga ki te wharekai i ia marama, e uru ai ngā kiritaki ka \$100 hemihemi te nui o te moni ka whakapaua i te wharekai ki tētahi whakataetae, e riro ai i a rātou tētahi taonga. I ia marama:

- e 35% o ngā kiritaki katoa o te wharekai ka whakapau i te \$100 hemihemi.
- $\frac{1}{5}$ o te hunga ka whakapau i te \$100 hemihemi ka whiwhi taonga.
- O ngā kaiwhiwhi taonga, e 40% ka whakawhiwhia ki tētahi puka whakakehenga utu e \$20 te uara, ā, ko ētahi atu ka whiwhi kawhe utu-kore.

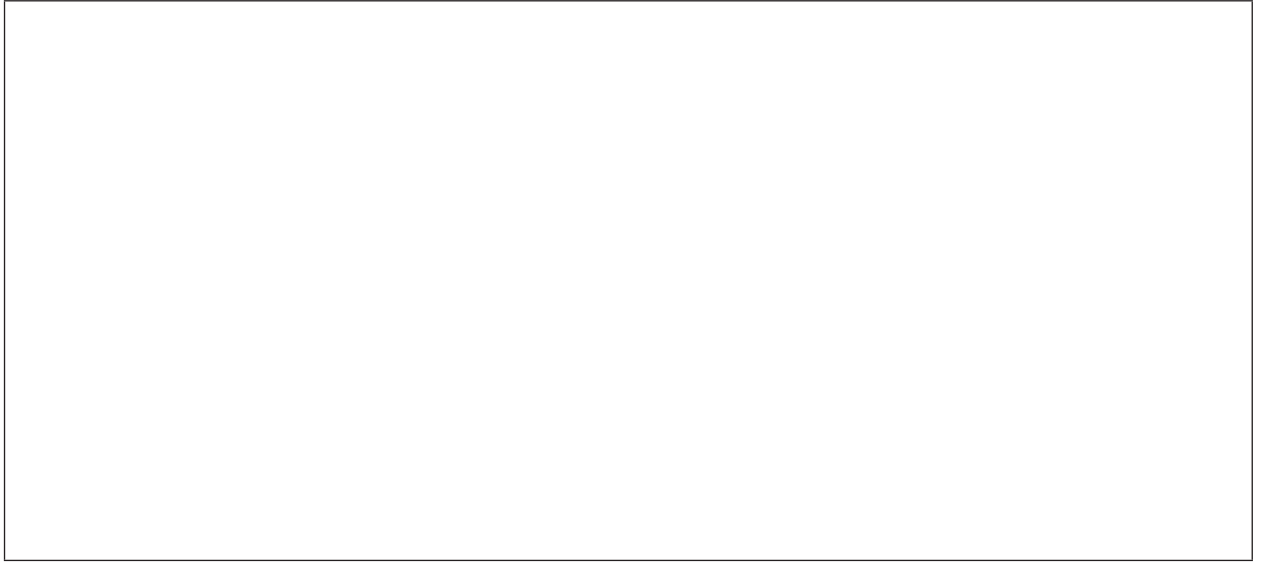
Tāia tētahi rākau tūponotanga, ka whakamahi ai hei whakaoti i ngā wāhanga e whai ake nei.

(i) E hia te ōwehenga o ngā kiritaki o te wharekai kāore e whiwhi taonga?

(ii) He aha te tūponotanga ka riro i tētahi kiritaki, ka \$100 hemihemi te nui o te moni ka whakapaua e ia ā tērā marama, tētahi kawhe utu-kore?

- (b) The cafe is running a loyalty promotion for each month, where customers who spend over \$100 at the cafe will go into a draw to win a prize. Each month:
- 35% of all cafe customers spend over \$100.
 - $\frac{1}{5}$ of those who spend over \$100 win a prize.
 - Of the prize winners, 40% receive a \$20 discount voucher, and others win a free coffee.

Draw a probability tree, and use it to answer the following parts.



- (i) What proportion of the cafe's customers do not win?

- (ii) What is the probability that a customer who spends over \$100 next month wins a free coffee?

- (iii) Ko ngā kiritaki i whakapau i te \$100 hemihemi, engari kāore i riro i a rātou tētahi kawhe utu-kore, tētahi puka whakahekenga utu rānei e \$20 te uara, e wātea ana ināianei kia whakawhiwhia ki tētahi o ngā taonga tupoho e rua, arā, ki tētahi pine, ki tētahi whakapiripiri rānei. Ko te tūponotanga ka riro i tētahi kiritaki matapōkere tētahi pine, ko te 0.21.

He aha te tūponotanga ka riro i te kiritaki tētahi whakapiripiri, i te whakawhiwhinga ki tētahi taonga tupoho?

- (iii) Those customers who spent over \$100, but did not win a free coffee or \$20 voucher, can now win one of two consolation prizes, a badge or a sticker. The probability of a random customer winning a badge is 0.21.

What is the probability of a customer winning a sticker, given they have won a consolation prize?

TE TŪMAHI TUATORU

- (a) Ka tuhia e ngā kaimahi o te wharekai ngā taipitopito e whai ake nei e pā ana ki ngā kiritaki, i runga i ngā kōwhiringa kawhe i paingia katoatia.

	Ngā taiohi	Ngā pakeke	Te tapeke
He mokatino	76	150	226
He rate	184	115	299
He kaputino	20	105	125
Te tapeke	280	370	650

- (i) E hia te ōrau o ngā kiritaki i tono kaputino ai?

- (ii) He aha te tūponotanga ka tonoa e tētahi taiohi, i kōwhiria matapōkeretia ai, tētahi rate?

- (iii) He aha te tūponotanga he pakeke, he tangata inu kaputino rānei tētahi kiritaki ka kōwhiria matapōkeretia?

QUESTION THREE

- (a) The cafe records the following information from customers, based on the most popular coffee selections.

	Teenagers	Adults	Total
Mocha	76	150	226
Latte	184	115	299
Cappuccino	20	105	125
Total	280	370	650

- (i) What percentage of customers ordered a cappuccino?

- (ii) What is the probability that a randomly selected teenager orders a latte?

- (iii) What is the probability that a randomly selected customer is either an adult or a cappuccino drinker?

Te Pāngarau me te Tauanga 91267M, 2025

- (b) From the data, the owner believes that it is twice as likely for an adult than for a teenager to order a mocha. His manager thinks that he is wrong.

- (i) Explain why the owner believes this.

- (ii) Show with appropriate calculations how the manager can prove to the owner that he is wrong.

*Question Three continues
on the following page.*

- | | Te anipā nā te kawhe | Kāore he anipā | Te tapeke |
|------------|----------------------|----------------|-----------|
| Ngā taiohi | 267 | | 390 |
| Ngā pakeke | | 130 | |
| Te tapeke | 347 | | 600 |

Whakaotia te tūtohi i te tuatahi, ka arotake ai i tēnei kōrero mā te whakamahi i ngā tātainga i runga i ngā raraunga, kātahi ka whakamāori i ngā tūraru e hāngai ana, i tēnei horopaki.

- (c) Research shows that there is a strong link between coffee consumption and anxiety in both adults and teenagers. Some findings suggest that there is a greater impact of coffee consumption on teenagers' anxiety than on adults'. The table shows some of these findings.

	Coffee induced anxiety	No anxiety	Total
Teenagers	267		390
Adults		130	
Total	347		600

A researcher claimed that teens are 80% more likely to be affected by anxiety due to coffee drinking than adults.

By first completing the table, evaluate this claim using calculations based on the data, and interpret the relative risks in context.

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU
TŪMAHI

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

QUESTION
NUMBER

**He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.**

TE TAU
TŪMAHI

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

QUESTION
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**He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.**

TE TAU
TŪMAHI

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

QUESTION
NUMBER

English translation of the wording on the front cover



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Mathematics and Statistics 2025

91267M Apply probability methods in solving problems

Credits: Four

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–MATHMF.

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 the margins (✂✂✂). 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.