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translation of this cover

3

91586M



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

Tohua tēnei pouaka mēnā
KĀORE koe i tuhi kōrero ki
tēnei pukapuka

Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2022

**91586M Te whakahāngai tuari tūponotanga i te wā e
whakaoti rapanga ana**

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakahāngai tuari tūponotanga i te wā e whakaoti rapanga ana.	Te whakahāngai tuari tūponotanga, mā roto i te whakaaro pānga, i te wā e whakaoti rapanga ana.	Te whakahāngai tuari tūponotanga, mā roto i te whakaaro waitara e whānui ana, i te wā e whakaoti rapanga 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.

Tuhia ō whiriwhiringa KATOA.

Tirohia kia kitea ai kei a koe te pukapuka Tikanga Tātai me ngā Tūtohi L3–STATMF

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

Tirohia kia kitea ai e tika ana te raupapatanga o ngā whārangi 2–19 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kua e tuhi i ngā wāhi e kitea ai te kauruku whakahāngai (✓). Ka poroa pea taua wāhanga ka mākahia ana te pukapuka.

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

TE TŪMAHI TUATAHI

E ai ki te whakatau tata mō tētahi kamupene hoko kākahu i Aotearoa, he hokotanga ka oti i te 35% o ngā kiri hoko ka uru ki ūna toa.

- (a) (i) Mā te whakamahi i tētahi hoahoa ā-tuari tūponotanga e tika ana, tātaia tētahi whakatau tata mō te tūponotanga e iti ake ana i te 3 o ngā kiri hoko 10 ka hoko i tētahi mea i te kuhunga ki tētahi toa.
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- (ii) Homai ngā whakapae E RUA mō te hoahoa ā-tuari tūponotanga i whakamahi ai koe i te wāhangā (i) hei whakaatu i te tokomaha o ngā kiri hoko ka hoko i tētahi mea i te kuhunga ki tētahi toa.

1. _____

2. _____

- (iii) He maha ngā toa o te kamupene hoko kākahu puta noa i Aotearoa.

Mā te whakamahi i tētahi hoahoa ā-tuari tūponotanga e tika ana, tātaia tētahi whakatau tata mō te tūpono e 3, e hia kē atu rānei i tērā, ngā kiri hoko o te tekau e whai mai ana, ka hoko mea i tēnā, i tēnā o ngā toa e 4.

QUESTION ONE

It has been estimated that for a New Zealand clothing retail company, a purchase is made by 35% of customers entering their stores.

- (a) (i) Using an appropriate probability distribution model, calculate an estimate for the probability that less than 3 of the next 10 shoppers make a purchase after entering a store.

- (ii) Give TWO assumptions made for the probability distribution model that you used in part (i) to model the number of customers making a purchase when entering a store.

1. _____

2. _____

- (iii) The clothing retail company has many stores throughout New Zealand.

Using an appropriate probability distribution model, calculate an estimate for the probability that at least 3 out of the next ten customers make a purchase in each of 4 different stores.

(iv) I puta tētahi whakapae i tō tātai i te whakatau tata o te tūponotanga i te wāhanga (iii).

Parahautia tēnei whakapae mā roto i te horopaki e tika ana.

(b) Tērā tētahi toa e whai ana i ngā ara ā-ipurangi e rua hei tono i ngā tūemi kua kore i te toa – ngā tono mā te ‘pāwhiri me te kohi’ me ngā tono kia ‘tukuna ki te kāinga’. Kei waenga i te 24 hāora me te 144 hāora te roa e rite ai tā te kiri hoko i tono ai mā te ‘pāwhiri me te kohi’. Mō te taha ki ngā tono kia tukuna ki te kāinga, ka taea te whakatauira te roa o te wā ka pau i mua i te taenga o te tono ki te kāinga, ki te tuari māori, arā, e 96 hāora te toharite, ā, e 38.4 hāora te ine mahora.

E rua ngā hoa ka tono i ā rāua rawa i te wā kotahi, ko tētahi e tono ana mā te ara o te 'pāwhiri me te kohi', ko tētahi e tono ana mā te ara kia 'tukuna ki te kāinga'.

Mā roto i te/ngā hoahoa tūponotanga e tika ana, me whakatau tata koe i te tūponotanga ka roa ake i te 120 hāora te tatari a ngā hoa kia whiwhi ai rāua i tā rāua i tono ai.

Parahautia ngā whakapae kua whakaaturia i a koe e whakatau tata ana i tēnei tūponotanga.

- (iv) An assumption was made when calculating the probability estimate in part (iii).

Justify this assumption in context.

- (b) A particular store offers two alternative online ordering methods for items that are out of stock in the store – ‘click and collect’ orders and ‘home delivery’ orders. The amount of time until a customer’s ‘click and collect’ order is ready for collection ranges between 24 hours and 144 hours. For home delivery orders, the time for the order to be delivered can be modelled with a normal distribution, with mean 96 hours and standard deviation 38.4 hours.

Two friends make online orders at the same time, one using the ‘click and collect’ method, and one using the ‘home delivery’ method.

Using appropriate probability model(s), estimate the probability that both friends wait more than 120 hours to receive their orders.

Justify any assumptions you have made when estimating this probability.

TE TŪMAHI TUARUA

- (a) He whāinga hokohoko ā te hunga whakahaere o te pakihi hokohoko kia kaua e iti ake i ngā kākahu e 4 ka hokona e ngā kiri hoko i ia 20 miniti i roto i te toa. Me kī, kua hoahoatia te maha o ngā kākahu e hokona nei e ngā kiri hoko o te pakihi nei i ia 20 miniti hei tuari ā-Poisson, ko te $\lambda = 2.8$.

- (i) Whakamahia tēnei hoahoa Poisson hei tātai i tētahi whakatau tata mō te tūponotanga i roto i tētahi 20 miniti, ka iti iho i ngā kākahu e 4 ka hokona e te kiri hoko.
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- (ii) Tuhia ngā take E RUA kāore nei pea e tika ana te tuari ā-Poisson hei hoahoa mō tēnei tūāhuatanga.

Te Take Tuatahi:

Te Take Tuarua:

- (iii) Me hia rawa te uara o te tohu mō te roa o te ngaru (λ), i runga i te hoahoa ā-Poisson, e kore ai e iti ake i te 99% o ngā kiri hoko katoa o tēnei pakihi ka hoko i tētahi, i ētahi rānei o ngā kākahu i ia 20 miniti?
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-
-
-

QUESTION TWO

- (a) Management of the retail company have set sales targets of customers purchasing at least 4 items of clothing per 20 minutes in the store. Suppose that the number of items purchased by this company's customers per 20 minutes in the store can be modelled by a Poisson distribution with $\lambda = 2.8$.

- (i) Use this Poisson model to calculate an estimate for the probability that in any 20 minute interval a customer purchases less than 4 items of clothing.

- (ii) Provide TWO reasons why the use of the Poisson distribution may not be appropriate to model this situation.

Reason One: _____

Reason Two: _____

- (iii) What would the value of lambda (λ) need to be so that, under a Poisson model, at least 99% of this company's customers purchase at least 1 item of clothing in a 20-minute interval?

- (b) Tae atu ai ngā rawa a te pakihī ki a rātou i roto i te pouaka, e 50 ngā kākahu kei roto i ia pouaka. Ka hihiratia aua kākahu i mua i te hokotanga atu mō te tūpono e tōrōkiri ana. Kei te tūtohi o raro iho nei te tuari tūponotanga o te taurangi matapōkere D , arā, te maha o ngā kākahu tōrōkiri i kitea rā i ngā pouaka o ngā kākahu e 50 i tae atu ai ki te pakihī.

d	0	1	2	3
Te Kaituku A $P(D = d)$	0.73	0.16	0.09	0.02
Te Kaituku B $P(D = d)$	0.66	0.23	0.07	0.04

- (i) Tātaia te toharite me te ine mahora o te maha o ngā tōrōkiri i ia pouaka e 50 ngā kākahu i tae atu rā ki te pakihī i te Kaituku A.

Te toharite = _____

Te ine mahora = _____

- (ii) He pai ake ki te pakihī hoko kākahu mēnā ka tae atu ki a rātou ngā kākahu e iti ana ngā kākahu tōrōkiri. He āwhina hoki mēnā e ōrite ana te maha o ngā kākahu tōrōkiri puta i ngā pouaka maha.

Whakamahia ngā whakaaro tauanga hei whakamārama i te kaituku e whakatutuki ana i tēnei pīrangī.

- (b) The company receives their stock in boxes of 50 clothing items. The items are checked for defects before being sold. The table below shows the probability distribution of the random variable D , the number of defective garments found per box of 50 clothing items received by the company.

d	0	1	2	3
Supplier A $P(D = d)$	0.73	0.16	0.09	0.02
Supplier B $P(D = d)$	0.66	0.23	0.07	0.04

- (i) Calculate the mean and standard variation of the number of defects per box of 50 clothing items received by the company from Supplier A.

Mean = _____

Standard deviation = _____

- (ii) The clothing retail company prefers to receive boxes of garments with low numbers of defective items. It is also helpful if the number of defective items per box is consistent over multiple boxes.

Use statistical reasoning to explain which supplier fulfils these requirements.

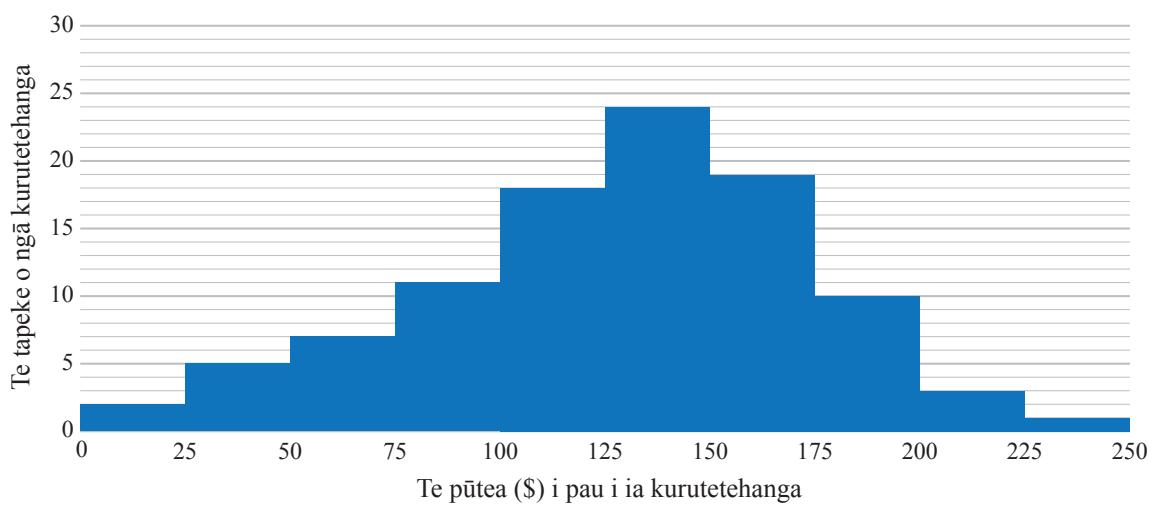
TE TŪMAHI TUATORU

Kohi raraunga ai te pakihī hoko kākahu mō te nui o te pūtea (\$) e whakapaua ana e ia kiri hoko i tētahi pekanga ki te toa (ngā kurutete).

He whakarāpopotohangā tauanga:

Te tapeke o ngā kurutetehanga	100
Te toharite o te paunga pūtea i ia kurutetehanga	\$127.75
Te ine mahora o te whakapaunga pūtea	\$46.22
Te whakapaunga pūtea e auau katoa ana	\$130
Te mōrahi o te whakapaunga pūtea	\$250

Te nui o te pūtea (\$) i pau i ngā kiri hoko i tētahi kurutetehanga



- (a) E kīia ana, kei kō atu i te 25% o ngā kurutetehanga katoa te whakapaunga o te pūtea \$150 hemihemi.

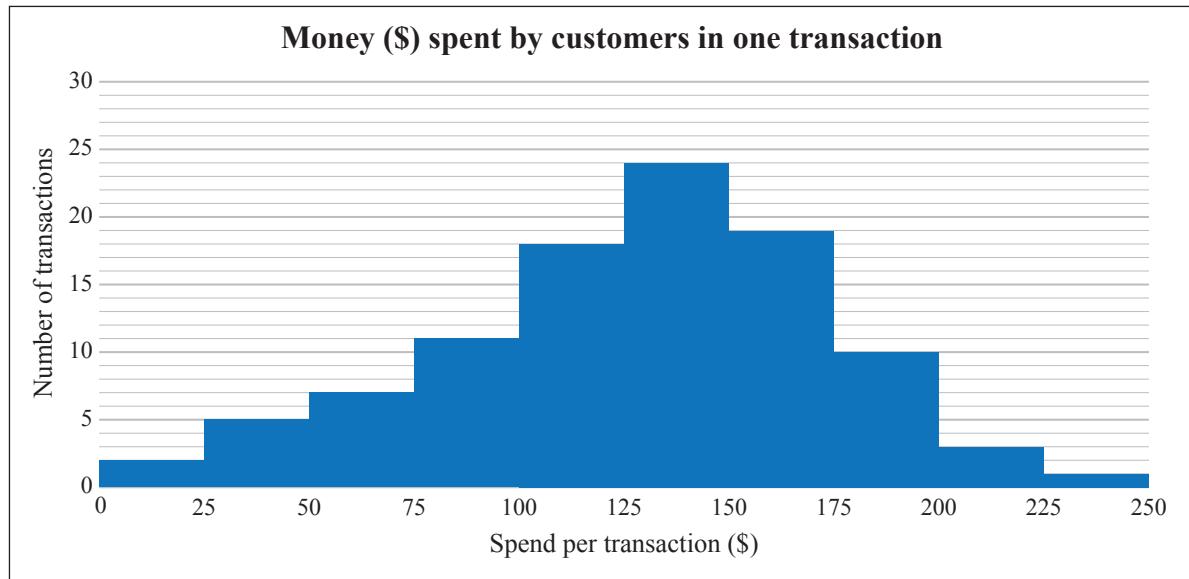
Kei te tika rānei taua kōrero?

Whakamahia he tātaihanga hei tautoko i tō tuhinga.

QUESTION THREE

The retail company collects data on the amount of money (\$) spent by each customer in one visit to a store (transaction).

Summary statistics:	
Number of transactions	100
Mean spend per transaction	\$127.75
Standard deviation of spend	\$46.22
Most common spend	\$130
Maximum spend	\$250



- (a) It is claimed that over 25% of transactions consist of spends of more than \$150.

Is this claim correct?

Use a calculation to support your answer.

- (b) Whakamahia tētahi hoahoa tuari māori ki te whakatau tata i te tūponotanga ka nui ake i te \$150 te whakapaunga a tētahi kiri hoko, kua kōwhiri matapōkeretia, i te kurutetehanga kotahi.
- Whakaaturia ngā whiriwhiringa hei taunaki i tō tuhinga.

- (c) Tautapahia tētahi hoahoa atu anō ka taea te whakamahi hei hoahoa i te whakapaunga pūtea a ngā kiri hoko i ia kurutetehanga i taua toa hoko kākahu.
- Tuhia ngā tawhā o tō hoahoa rerekē.

- (d) Whakamahia tēnei hoahoa rerekē ki te whakatau tata i te tūponotanga ka whakapaua e tētahi kiri hoko, kua kōwhiri matapōkeretia, te \$150 i te kurutetehanga kotahi, mēnā kei kō atu tana whakapaunga pūtea i te \$130.

- (b) Use a normal distribution model to estimate the probability that a randomly chosen customer spends more than \$150 in one transaction.

Show working to support your answer.

- (c) Suggest an alternative model that could be used for modelling customer spend per transaction at this particular retail company.

State the parameters of your alternative model.

- (d) Use this alternative model to estimate the probability that a randomly chosen customer spends more than \$150 in one transaction, given that they spend more than \$130.

- (e) Whakatairitea ō whakatau tata ā-tūponotanga mā te whakamahi i ngā hoahoa tūponotanga e rua me tō tātaihanga tūponotanga mai i ngā raraunga i te wāhanga (a).

Ko tēhea te hoahoa e pātata ake ana te whakatau tata o te tūponotanga ka whakapaua e te kiritaki te \$150 i te kurutetehanga kotahi?

- (f) Tūtohua te hoahoa (te hoahoa tuari māori rānei, te hoahoa rerekē rānei) e tika ana kia whakamahia mō te whakapaunga pūtea i ia kurutetehanga i taua toa.

I tō tuhinga, me parahau tō kōwhiringa i te tuarihanga me te tautohu i te/ngā tawhā o tēnei tuarihanga.

- (e) Compare your probability estimates using the two different probability models with your probability calculated from the data in part (a).

Which model gives the closest estimate of the probability that a customer spends more than \$150 in one transaction?

- (f) Recommend which model (normal distribution model or alternative model) should be used for modelling the spend per transaction in this particular store.

In your answer you should justify your choice of distribution and identify the parameter(s) of this distribution.

**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
NUMBER

English translation of the wording on the front cover

Level 3 Mathematics and Statistics (Statistics) 2022

91586M Apply probability distributions in solving problems

Credits: Four

91586M

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability distributions in solving problems.	Apply probability distributions, using relational thinking, in solving problems.	Apply probability distributions, 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–STATMF.

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 2–19 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (☒). This area may be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.