

See back cover for an English translation of this cover

# 3

91586M



915865



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

## Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2014

### 91586M Te whakahāngai i ngā tuari tūponotanga hei whakaoti rapanga

9.30 i te ata Rāpare 20 Whiringa-ā-rangi 2014  
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakahāngai i ngā tuari tūponotanga hei whakaoti rapanga.	Te whakahāngai i ngā tuari tūponotanga mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai i ngā tuari tūponotanga mā te whakaaro waitara hōhonu hei whakaoti rapanga.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

**Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.**

Whakaaturia ngā mahinga KATOA.

Me mātua riro mai i a koe te pukaiti o ngā Tikanga Tātai me ngā Papatau L3–STATMF.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–15 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

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

TAPEKE

MĀ TE KAIMĀKA ANAKE



**QUESTION ONE**

- (a) The amount of caffeine in a “single shot” coffee can be modelled by a normal distribution, with mean 115 mg and standard deviation 10 mg.

Suppose that a customer orders three “single shot” coffees.

Calculate the probability that **all three** coffees contain between 108 mg and 122 mg of caffeine.

Give any assumption(s) that need to be made.

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- (b) The time it takes for a person to feel the effects of the caffeine in their coffee after they drink it can be modelled by a random variable that takes on values between 0 minutes and 40 minutes. The most likely time it takes a person to feel the effects of the caffeine in their coffee is 10 minutes.

Using an appropriate model, calculate the probability that it will take less than five minutes OR more than 10 minutes for a person to feel the effects of the caffeine in their coffee.

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## PĀTAI TUARUA

- (a) Ko te whakatauranga tata a tētahi rangatira whare kawhe he 30% o ngā inu kawhe latte ka mahia mai i te miraka mōmona iti. I roto i te kotahi wiki, i tuhia e te rangatira whare kawhe e hia ngā latte i mahia ki te miraka mōmona iti, ki tētahi atu momo miraka rānei, mō ngā “huinga” o ngā ota latte piritata e rima.
- (i) Parahautia te whakamahinga o te tuari huarua hei whakatauranga i te maha o ngā latte i roto i tētahi huinga o te 5 ka mahia mai i te miraka mōmona iti.

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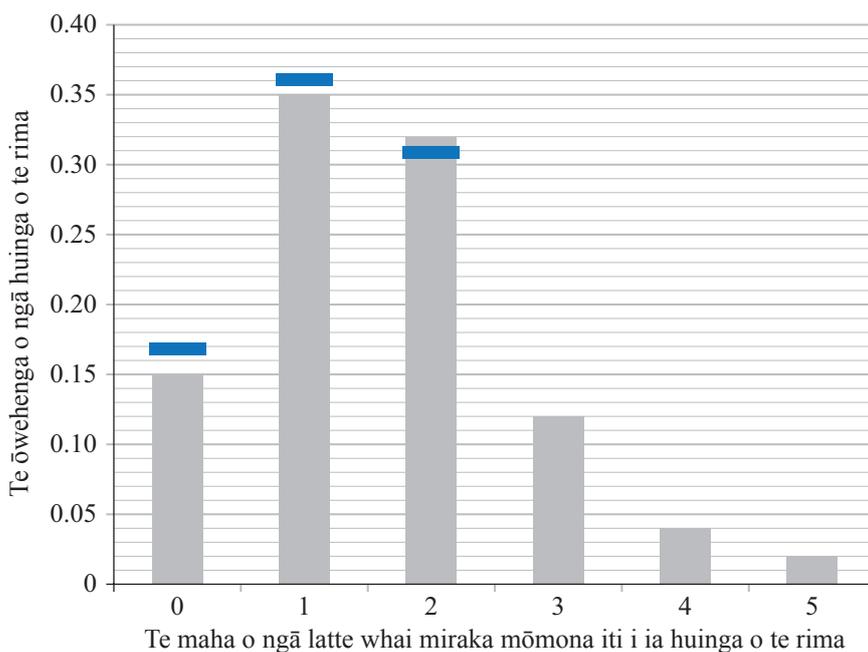
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- (ii) Kua tīmata te rangatira whare kawhe ki te whakaputa i tētahi kauwhata e whakataurite ana i ngā raraunga i kohia (te tuari whakamātau e whakaaturia kaurukitia ana) me te tauira tuari huarua (te tuari ariā e whakaaturia ana ki te kikorangi).

Whakaotihia te kauwhata mā te whakaatu i ngā uara e toe ana mō te tauira tuari huarua.



(iii) Matapakitia he aha te/ngā whakataua ka puta ki te rangatira whare kawhe mai i te kauwhata kua oti i te whārangi 6.

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(b) Ko te tau toharite o ngā ota ā-waea mō te kawhe i te hāora i whiwhi i te whare kawhe he 4.6.

(i) Mā te whakamahi i tētahi tauira tuari tūponotanga tōtika, tātaihia te tūponotanga e rua te mōrahi o ngā ota ā-waea mō te kawhe ka whiwhi i te whare kawhe i roto i tētahi hawhe hāora.

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(ii) Mō te whakamahi i te tuaritanga ka whakamahia i te wāhanga (b)(i), me puta kia kotahi te whakapaenga, neke atu rānei.

Tautohua kia kotahi te whakapaenga kei te hē pea, ā, matapakihia te take e pēnei ai.

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**QUESTION TWO**

(a) A café owner estimates that 30% of latte coffees are made with trim milk. Over a period of a week, the café owner has recorded how many lattes were made with trim milk or with other milk for “sets” of five consecutive latte orders.

(i) Justify the use of the binomial distribution to model the number of lattes in a set of 5 that are made with trim milk.

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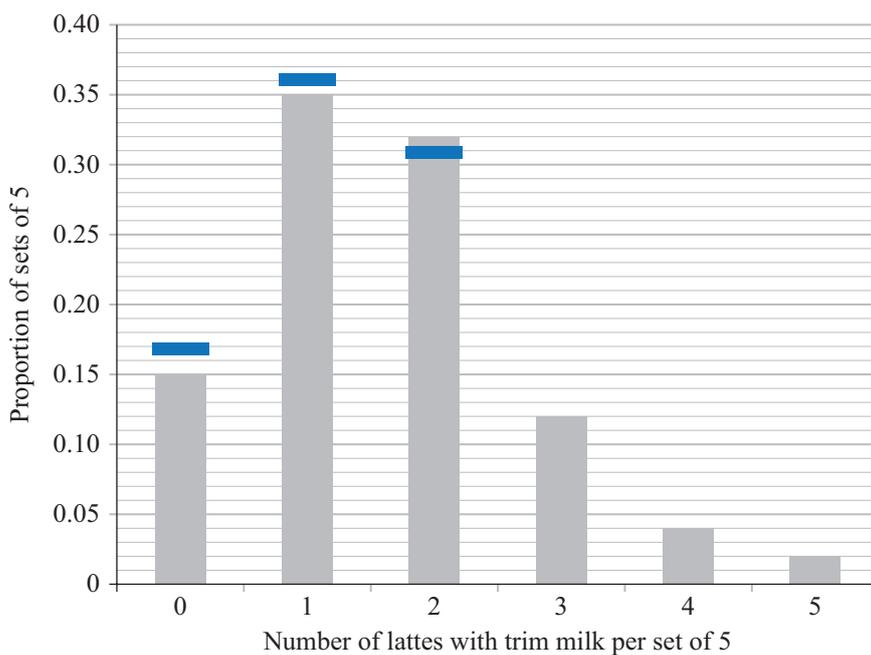
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(ii) The café owner has begun to produce a graph comparing the data collected (the experimental distribution shown shaded) and the binomial distribution model (the theoretical distribution shown in blue).

Complete the graph by showing the remaining values for the binomial distribution model.



- (iii) Discuss what conclusion(s) the café owner could draw from the completed graph on page 8.

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- (b) The mean number of phone orders for coffee per hour received by the café is 4.6.

- (i) Using a suitable probability distribution model, calculate the probability that the café receives at most two phone orders for coffee over any half-hour period.

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- (ii) To apply the distribution used in part (b)(i), at least one assumption needs to be made. Identify one such assumption that may be invalid, and discuss why this is the case.

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**PĀTAI TUATORU**

- (a) E whakaatu ana te tūtohi i raro nei i te tuari tūponotanga o te taurangi matapōkere  $N$ , te maha o ngā ota mō ngā kawhe hei kawhe atu mā tētahi kiritaki.

$n$	1	2	3	4	5
$P(N = n)$	0.49	0.31	0.1	0.08	0.02

- (i) Tātaihia te tau toharite o ngā kawhe hei kawhe atu i otahia e ngā kiritaki.

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- (ii) Ka whiwhi ngā kiritaki katoa i tētahi paepae pepamārō hei kawhe atu i ā rātou kawhe.

Ko te utu mō te mahi i ia kawhe, tae atu ki ngā rauemi me te mahi, he \$1.80.

Ko te utu o tētahi paepae pupuri i ngā kawhe tae atu ki te rua he \$0.20.

Ko te utu o tētahi paepae pupuri i ngā kawhe e toru tae atu ki te rima he \$0.40.

Tātaihia te utu e tūmanakohia ana mō ia ota kawhe kawhe atu.

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- (b) He pātara kei te kiripaepae o te whare kawhe mā ngā kiritaki hei tuku whakaaro ki tētahi kaupapa aroha o te rohe. Kāore te whare kawhe i te mōhio e hia te moni ka tukuna mai i ia wā e ia kiritaki, ēngari ko te nui e tūmanakohia kei waenga i te 50 heneti me te rima tāra.

- (i) Mā te whakamahi i tētahi tauira tōtika, whakatauhia te rahinga mōrahi ka tūmanakohia e te toa kawhe kāore e ekehia e ngā whakaaro a ngā kiritaki 80%.

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(ii) Parahautia tō tīpakotanga o te tauira tuari tūponotanga tōtika.

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(c) I tuhia e tētahi kamupene hoko pīni kawhe te maha o ngā toronga i tana paetukutuku i roto i ngā wāhanga wā 15 meneti i roto i ngā marama e rua kua hipa. I kitea e te kamupene o aua wāhanga wā e 96%, kotahi te toronga ki te paetukutuku i te iti rawa.

Tātaihia te tūponotanga neke atu i te 10 ngā toronga ki te paetukutuku i roto i tētahi wāhanga wā 30 meneti.

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**QUESTION THREE**

- (a) The table below shows the probability distribution of the random variable  $N$ , the number of takeaway coffees ordered by a customer.

$n$	1	2	3	4	5
$P(N = n)$	0.49	0.31	0.1	0.08	0.02

- (i) Calculate the mean number of takeaway coffees ordered by customers.

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- (ii) All customers are given a cardboard tray to carry their takeaway coffees.

The cost to make each coffee, including the cost of the materials and labour, is \$1.80.

The cost of a tray that can hold up to two coffees is \$0.20.

The cost of a tray that can hold three to five coffees is \$0.40.

Calculate the expected cost of each takeaway coffee order.

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- (b) A café has a jar on the front counter for customers to give money for a local charity. The café is not sure how much each customer will give each time, but expects an amount between 50 cents and five dollars.

- (i) Using an appropriate model, determine the maximum amount that the café would expect 80% of customers to donate less than.

- (ii) Justify your selection of an appropriate probability distribution model.

- (c) A company that sells coffee beans recorded the number of visits to its website in 15-minute periods over the last two months. The company found that in 96% of such periods, there was at least one visit to the website.

Calculate the probability that the website will receive more than 10 visits in any given 30-minute period.





*English translation of the wording on the front cover*

## **Level 3 Mathematics and Statistics (Statistics), 2014**

### **91586 Apply probability distributions in solving problems**

9.30 am Thursday 20 November 2014

Credits: Four

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
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.

91586M

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 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 2–15 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.**