

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

Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2015

91586M Te whakahāngai i ngā tuari tūponotanga hei whakaoti rapanga

2.00 i te ahiahi Rāpare 19 Whiringa-ā-rangi 2015
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 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.

Tuhia ō mahinga KATOA.

Tirohia mēnā kei a koe te pukapuka Tikanga Tātai me ngā Tūtohi L3–STATMF.

Mēnā ka hiahia whārangi atu anō koe mō ō tuinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–15 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

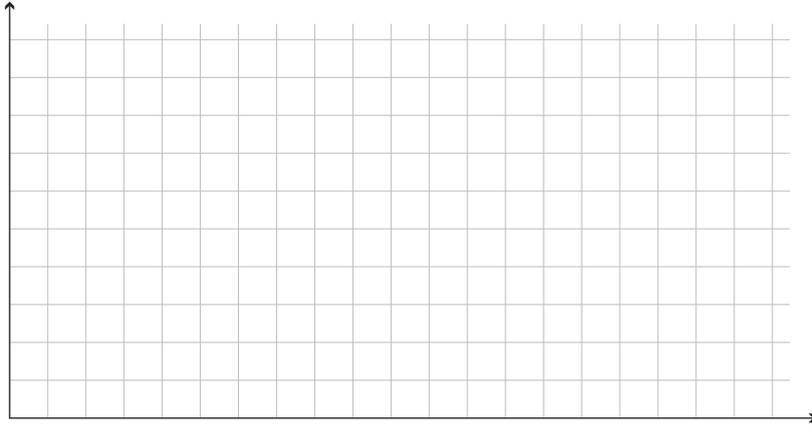
TŪMAHI TUATAHI

(a) I te teihana tereina A, ko te wā e tae mai ai te tereina whai ake kei waenga i te 2 me te 12 meneti, ā, me te mea nei ka ōrite te tūponotanga o ngā wā katoa i waenga.

I te teihana tereina B, ko te wā e tae mai ai te tereina whai ake kei waenga i te 4 me te 9 meneti, ā, me te mea nei ka ōrite te tūponotanga o ngā wā katoa i waenga.

(i) Mā te whakamahi i te tauira tuari tūponotanga tōtika, tātuhia ia tuaritanga ki ngā tuaka ōrite i raro.

Tāpirihia ngā kōrero katoa e hāngai ana me te āta tapa i ia tuaritanga.



(ii) Tātaitia te tūponotanga ka neke atu i te 8 meneti mō tērā tereina ki te tae atu ki te teihana tereina A, ā, neke atu i te 8 meneti mō tērā tereina whai ake ki te tae atu ki te teihana tereina B.

Homai ngā whakapae e hiahiatia ana.

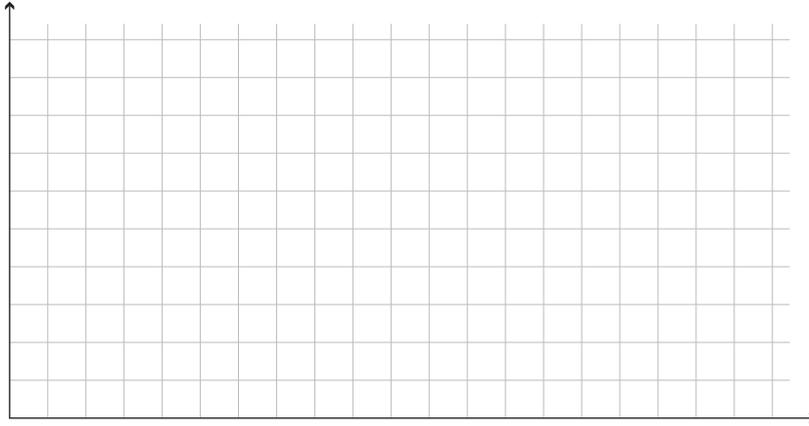
QUESTION ONE

- (a) At train station A, the time it will take for the next train to arrive is between 2 and 12 minutes, with all times in between equally likely.

At train station B, the time it will take for the next train to arrive is between 4 and 9 minutes, with all times in between equally likely.

- (i) Using an appropriate probability distribution model, sketch each distribution on the same axes below.

Add as much relevant information as possible and clearly label each distribution.



- (ii) Calculate the probability that it takes more than 8 minutes for the next train to arrive at train station A and more than 8 minutes for the next train to arrive at train station B.

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

(b) Ko te whakatau tata he 13% o ngā waka e taraiwahia ana i ngā huarahi o Aotearoa he whero. Tērā ka mātaitia ngā tae o ngā waka e whitu e hipa ana ki te ara kōaro ki tētahi kaitaraiwa.

(i) Mā te whakamahi i tētahi tauira tuari tūponotanga tōtika, tātaihia te tūponotanga e rua i te iti rawa o ngā waka e whitu he whero.

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

(iii) Mō te maha n o ngā waka ka hipa i te ara kōaro ki te kaitaraiwa, ko te tūponotanga ko tētahi waka kotahi i te iti rawa he whero he 0.965 (e whakaawhiwhia ana ki ngā mati whaiira e 3).

Whakatauria te uara o n .

Tautokona tō tuhinga ki ngā tauākī me ngā tātaianga tauanga e tōtika ana.

- (b) It is estimated that 13% of the cars driven on New Zealand roads are red.

Suppose that the colours of the next seven cars that pass in an opposite lane to a driver are observed.

- (i) Using an appropriate probability distribution model, calculate the probability that at least two of the seven cars are red.

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

- (iii) For n number of cars that pass in an opposite lane to a driver, the probability that at least one of the cars is red is 0.965 (rounded to 3 decimal places).

Determine the value of n .

Support your answer with appropriate statistical statements and calculations.



TŪMAHI TUARUA

- (a) E whakangungu ana tētahi kamupene whakangungu kaitaraiwa i ngā kiritaki mō te whakamātautau raihana whakatiki. Kua tuhia e te kamupene ngā kōrero mō ngā kiritaki i hipa i a rātou te whakamātautau.

E whakaatu ana te tūtohi i raro nei i te tuari tūponotanga o te taurangi matapōkere N , te maha o ngā whakamātautanga i te whakamātautau raihana whakatiki a ngā kiritaki o tēnei kamupene. Kei roto i te maha o ngā whakamātautanga ko te whakamātautanga i hipa i te kiritaki te whakamātautau.

n	1	2	3	4
$P(N = n)$	0.82	0.14	0.03	0.01

- (i) Tātaitia te maha toharite o ngā whakamātautanga o te whakamātautau raihana whakatiki a ngā kiritaki o tēnei kamupene i hipa i a rātou te whakamātautau.

- (ii) Ko te utu o te whakamātautau raihana whakatiki he \$137 mō ia whakamātautanga.

I tua atu i tēnei, ka whakatau utu pūmau te kamupene mā ngā kiritaki mō te whakangungu i a rātou mō te whakamātautau, ahakoa te maha o ngā whakamātautanga a te kiritaki.

Mō ngā kiritaki o tēnei kamupene i hipa i a rātou te whakamātautau, ko te tapeke toharite i utua mō ngā whakamātautau me te whakangungu taraiwa he \$468.51.

Tātaitia te utu pūmau ka whakatauhia e te kamupene.

- (b) E aroturuki ana tētahi mana ikiiki ā-rohe i te maha o ngā pakarutanga pahi i roto i tētahi wā roa. E ai ki ngā raraunga i kohia, ko te maha toharite o ngā pakarutanga mō ia hāora he 0.3.

E whakamahia ana e te kaiwhakahaere mō te mana ikiiki tētahi tuaritanga Poisson hei whakatauhia i te maha o ngā pakarutanga pahi mō tētahi wā i whakaritehia.

- (i) Mā te whakamahi i tēnei taura, tātaitia te tūponotanga e kore e nui atu i te rua ngā pakarutanga pahi i roto i tetahi wā o te whā hāora.

Homai ngā whakapae e hiahia ana.

QUESTION TWO

- (a) A car-driving training company prepares customers for the restricted licence test. The company has recorded information about customers who were successful at passing the test. The table below shows the probability distribution of the random variable N , the number of attempts at the restricted licence test by customers of this company. The number of attempts includes the attempt where the customer was successful at passing the test.

n	1	2	3	4
$P(N = n)$	0.82	0.14	0.03	0.01

- (i) Calculate the mean number of attempts at the restricted licence test by customers of this company who were successful at passing the test.

- (ii) The cost of the restricted license test is \$137 per attempt.

In addition to this, the company charges a fixed price for customers to prepare them for the test, regardless of how many attempts the customer takes.

For customers of this company that were successful at passing the test, the mean amount paid for tests and driving training was \$468.51.

Calculate the fixed price charged by the company.

- (b) A local transport authority has been monitoring the number of bus breakdowns over a long period of time. Based on the data collected, the mean number of breakdowns per hour is 0.3.

The operations manager for the transport authority uses a Poisson distribution to model the number of bus breakdowns during a set period of time.

- (i) Using this model, calculate the probability that there are no more than two bus breakdowns during any four-hour period.

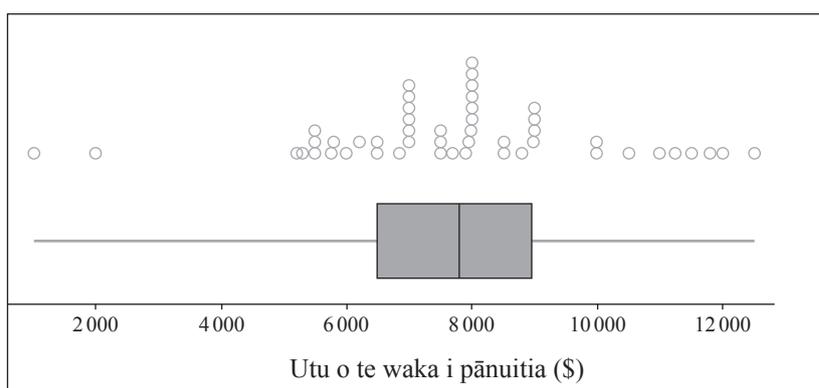
Give any assumption(s) that needs to be made.

TŪMAHI TUATORU

- (a) Ko te utu mō ngā waka hatchback tekau tau te tawhito i hokona i Aotearoa i te tau 2014 ka taea te whakatauiria mā tētahi tuaritanga māori, me te utu toharite o te \$7500 me te ine mahora o te \$2000.
- (i) Me kī he “nui rawa te utu” mēnā ka neke atu te utu o ngā waka hatchback tekau tau te tawhito i te \$9000.

E ai ki te tauira kua tukuna, tātaitia te ōrautanga o ngā waka “nui rawa te utu” i hokona atu mō te utu neke atu i te \$9500.

- (ii) Ka whiwhi i tētahi ākonga Tau 13 ngā raraunga mō tētahi tīpakotanga matapōkere o ngā waka hatchback e 49 tekau tau te tawhito mai i tētahi paetukutuku tauhokohoko tuihono i Aotearoa i te tau 2014. E whakaaturia ana ngā utu o ēnei waka i pānuitia ki te hoahoa i raro.



E whakapae ana te ākonga kāore i te tuari māoritia ngā utu o ngā waka hatchback tekau tau te tawhito, i te mea kei te paku tītaha tōrarotia kētia te tuaritanga o ngā utu waka i roto i te tīpakotanga.

Matapakitia te take kei te hē pea te ākonga i roto i ana whakaaro whaitake.

Homai kia RUA neke atu ngā take matapaki.

- (b) Ka taea te whakatauiria te roa o te wā e haere ana tētahi waka i te huarahi i Ōtepoti mā tētahi taurangi matapōkere e whai uara i waenga i te 3 me te 8 meneti. Ko te tino wā pea ka taea he 4 meneti.

Whakamahia tētahi tauira tuari tūponotanga tapatoru:

- (i) Tātaitia te tūponotanga he roa ake i te 4 meneti ka pau ina haere mā runga waka i tēnei roanga huarahi.

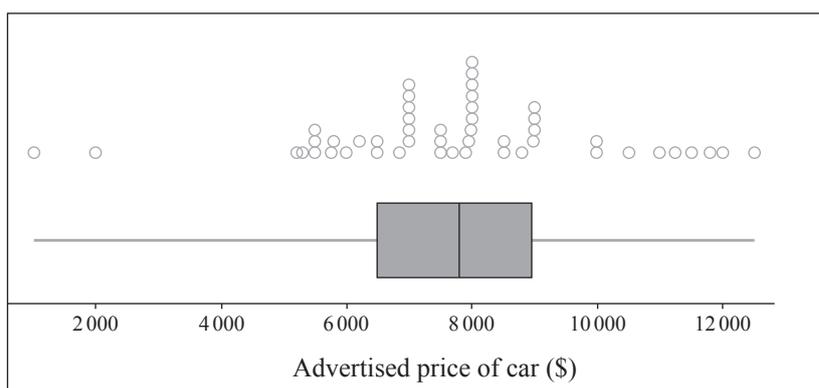
- (ii) Whakamāramahia mai te take ko te wā tau waenga e haere ana mā runga waka i tēnei huarahi ehara i te 6 meneti.

QUESTION THREE

- (a) The prices of ten-year-old hatchback cars sold in New Zealand during 2014 can be modelled by a normal distribution, with mean \$7500 and standard deviation \$2000.
- (i) Ten-year-old hatchback cars could be considered “over-priced” if they sold for more than \$9000.

Based on the model provided, calculate the percentage of “over-priced” cars that sold for more than \$9500.

- (ii) A Year 13 student obtained data on a random sample of 49 ten-year-old hatchbacks from a New Zealand online trading website during 2014. The advertised prices of these cars are shown in the figure below.



The student claims that the prices of ten-year-old hatchback cars are not normally distributed, as the distribution of car prices in the sample is negatively skewed.

Discuss why the student may be incorrect in their reasoning.

Give at least TWO discussion points.

- (b) The time taken to travel along a stretch of motorway in Dunedin by car can be modelled by a random variable that takes on values between 3 and 8 minutes. The most likely time taken is 4 minutes.

Using a triangular probability distribution model:

- (i) Calculate the probability that it will take more than 4 minutes to travel along this stretch of motorway by car.

- (ii) Explain why the median time taken to travel this stretch of motorway by car is not 6 minutes.

English translation of the wording on the front cover

Level 3 Mathematics and Statistics (Statistics), 2015

91586M Apply probability distributions in solving problems

2.00 p.m. Thursday 19 November 2015
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 space 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.