

# 3

91585M



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

**91585M Te whakahāngai ariā tūponotanga hei whakaoti  
rapanga**

2.00 i te ahiahi Rāpare 19 Whiringa-ā-rangi 2015  
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakahāngai ariā tūponotanga hei whakaoti rapanga.	Te whakahāngai ariā tūponotanga mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai ariā 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) E whakaatu ana te papatau e whai ake i te maha o ngā waka i pūrongohia ki Ngā Pirihimana o Aotearoa kua tāhaetia mai i te tau 2011 ki te 2013, ā, me te maha o ngā waka e rēhitatia ana ki Te Waka Kotahi i aua tau anō.

	2011	2012	2013
<b>Te maha o ngā waka i pūrongohia kua tāhaetia</b>	20 724	17 807	19 221
<b>Te maha o ngā waka i rēhitatia</b>	4 210 511	4 248 612	4 315 539

- (i) Ko ēhea o ēnei tau i nui ake te mōreareatanga whānui ka tāhaetia tētahi waka i Aotearoa? Tautokona tō tuhinga ki ngā tātainga tōtika.

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- (ii) Homai kia KOTAHI te pūtake he aha i noho ai ngā mōreareatanga i tātaitia i te wāhanga (i) hei whakatau tata noa iho o te mōreareatanga whānui tūturu ka tāhaetia he waka i taua tau.

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- (iii) Kei te hiahia tētahi rangatira o tētahi waka ki te whakamahi i te mōreareatanga whānui ka tāhaetia he waka i Aotearoa i te tau 2013 hei whakatau tata i te mōreareatanga ka tāhaetia tōna ake waka i te tau 2015.

Matapakitia he aha atu anō ngā mea hei whakaaroaro mā te rangatira o te waka hei whakatau tata i tēnei mōreareatanga.

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**QUESTION ONE**

- (a) The following table shows the number of vehicles reported to the NZ Police as stolen over 2011 to 2013, and the number of vehicles registered with the NZ Transport Agency in each of these years.

	<b>2011</b>	<b>2012</b>	<b>2013</b>
<b>Number of vehicles reported as stolen</b>	20 724	17 807	19 221
<b>Number of vehicles registered</b>	4 210 511	4 248 612	4 315 539

- (i) Which of these years had the greatest overall risk of a vehicle being stolen in New Zealand?

Support your answer with appropriate calculations.

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- (ii) Give ONE reason why the risks calculated in part (i) are only estimates of the true overall risk of a vehicle being stolen in that year.

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- (iii) A car owner wants to use the overall risk of a car being stolen in New Zealand during 2013 to estimate the risk of their own car being stolen during 2015.

Discuss what else the car owner should consider to estimate this risk.

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- (b) Kua tuhia e tētahi kaiwhakauru waka tukuruā ki Aotearoa mēnā kei te taha mauī, te taha matau rānei o te waka te taupoki penehīni o ia waka, i tua atu ki ētahi atu kōrero mō ngā waka.

Mō te kawenga whakamutunga o ngā waka tukuruā i kawea mai, i  $\frac{13}{21}$  o ngā waka kei te taha mauī te taupoki penehīni, ā, 22.8% o ngā waka he hiriwa.

- (i) Ka kōwhirihia matapōkeretia tētahi waka mai i taua kawenga o ngā waka tukuruā.

Whakatauhia te tūponotanga he hiriwa taua waka ka mutu kei te taha mauī te taupoki penehīni.

Tuhia te whakapae e hiahiatia ana hei whakatau i tēnei tūponotanga.

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- (ii) Kua kite tētahi kiritaki i tētahi teihana penehīni o ngā waka tekau e tiki penehīni ana i tēnei wā, e whitu o aua waka kei te taha mauī te taupoki penehīni.

Me whakamārama atu ki te kiritaki kia kaua ia e whakaputa kīanga whānui ko te nuinga o ngā waka i Aotearoa kei te taha mauī ngā taupoki penehīni, e ai ki ngā kitenga a te kiritaki.

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- (b) An importer of second-hand cars into New Zealand has recorded whether each car has the petrol cap on the left-hand side or the right-hand side of the car, in addition to other information about the cars.

For the last shipment of second-hand cars imported,  $\frac{13}{21}$  of the cars had the petrol cap on the left-hand side and 22.8% of the cars were silver.

- (i) One car is chosen at random from this shipment of imported second-hand cars.

Determine the probability that this car is silver and has the petrol cap on the left-hand side.

State the assumption you need to make to determine this probability.

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- (ii) A customer at a petrol station has observed that of the ten cars currently getting petrol, seven of these cars have petrol caps on the left-hand side.

Explain to the customer why a generalisation should not be made that cars in New Zealand are more likely to have petrol caps on the left-hand side, based on what the customer has observed.

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## TŪMAHI TUARUA

- (a) E whakapaetia ana tētahi kaiwhakauru waka ki Aotearoa kei te whakaawhiwhi ia i ngā tatau ine-tawhiti (te ine o ngā kiromita tapeke kua haerehia e te waka) ki te 10 kiromita tūtata mō ētahi o ngā pānuitanga kei tana paetukutuku.

E 20 ngā waka e pānuitia ana i tēnei wā e te kaiwhakauru hei hoko atu i runga i tana paetukutuku.

Kei raro e rārangi haere ana ngā tatau ine-tawhiti mō ēnei waka.

1 485	25 384	25 499	26 890	29 568
35 279	47 872	49 200	64 788	68 050
72 690	75 730	84 457	91 575	92 297
93 033	109 532	113 395	137 209	142 980

- (i) He aha te ōwehenga o ngā waka e pānuitia ana e te kaiwhakauru he 0 te tau whakamutunga o te tatau ine-tawhiti?

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- (ii) Mā te whakaaro ko te tau whakamutunga o tētahi tatau ine-tawhiti mō tētahi waka ka whakatauhia mā te tūponotanga anake, homai he tauira (ariā) whakatau tata mō te tūponotanga he 0 te tau whakamutunga o te tatau ine-tawhiti.

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- (iii) I whakahaerehia e tētahi kiritaki āwangawanga he whakataruna hei tūhura i te taurangitanga i roto i te ōwehenga o ngā waka ki ngā tōpū 20 he 0 te tau whakamutunga o te tatau ine-tawhiti, i runga i te whakapae ko te tau whakamutunga o tētahi tatau ine-tawhiti mō tētahi waka ka whakatauhia e te tūponotanga anake.

E whakaaturia ana i raro tētahi whakarāpopototanga o ngā otinga whakataruna (1000 whakamātautau).

<b>Ōwehenga he 0 te tau whakamutunga</b>	$\frac{0}{20}$	$\frac{1}{20}$	$\frac{2}{20}$	$\frac{3}{20}$	$\frac{4}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{7}{20}$	$\frac{8}{20}$ neke atu rānei
<b>Auautanga</b>	130	260	289	187	92	32	9	1	0

I runga i ēnei otinga whakataruna, he aha te whakatau a te kiritaki mēnā ka riro mā te tūponotanga anake e whakarite ai te tau whakamutunga o tētahi tatau ine-tawhiti mō ngā waka e pānuitia ana?

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**QUESTION TWO**

- (a) An importer of cars into New Zealand is suspected of rounding the odometer reading (the measure of the total kilometres the car has driven) to the nearest 10 kilometres for some of the advertisements on their website.

The car importer currently has 20 cars listed for sale on their website.

The odometer readings for these cars are listed below.

1 485	25 384	25 499	26 890	29 568
35 279	47 872	49 200	64 788	68 050
72 690	75 730	84 457	91 575	92 297
93 033	109 532	113 395	137 209	142 980

- (i) What proportion of cars advertised by the importer has 0 as the last digit of the odometer reading?
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- (ii) Assuming that the last digit of an odometer reading for a car is determined by chance alone, give a model (theoretical) estimate for the probability that the last digit of an odometer reading is 0.
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- (iii) A concerned customer conducted a simulation to investigate the variability in the proportion of cars in sets of 20 that have 0 as the last digit of the odometer reading, based on an assumption that the last digit of an odometer reading for a car is determined by chance alone.

A summary of the simulation results is shown below (1000 trials).

<b>Proportion with 0 last digit</b>	$\frac{0}{20}$	$\frac{1}{20}$	$\frac{2}{20}$	$\frac{3}{20}$	$\frac{4}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{7}{20}$	$\frac{8}{20}$ or higher
<b>Frequency</b>	130	260	289	187	92	32	9	1	0

Based on these simulation results, what conclusion could the customer make in respect to whether or not the last digit of an odometer reading for the cars advertised is determined by chance alone?

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- (b) I te tau 2013, 63.9% o ngā waka i kawea mai i tāwāhi i rēhitatia ki Te Waka Kotahi i mahia mai i Hapani. O ēnei waka i mahia i Hapani, 80.3% he waka tukuruu.

Me whakaaro i kōwhirihia matapōkeretia tētahi o ngā waka i kawea mai i tāwāhi i rēhitatia ki Te Waka Kotahi i te tau 2013.

- (i) Whakamāramahia mai te take ehara i te tāuke tētahi i tētahi ēnei pāpono “I mahia mai i Hapani” me “He waka tukuruu te waka”.

Whakaurua ngā whakaaro whaitake o te tauanga ki tō whakamāramatanga.

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- (ii) Whakamāramahia mai te take ka taea te whakatau mai i ēnei kōrero anake ko te waka i tīpakohia ko te āhua nei i mahia mai i Hapani, i te mea he waka tukuruu te waka i tīpakohia.

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- (b) In 2013, 63.9% of imported cars registered with the New Zealand Transport Agency were manufactured in Japan. Of these cars manufactured in Japan, 80.3% were used cars.

Suppose that one of the imported cars registered with the New Zealand Transport Agency in 2013 was selected at random.

- (i) Explain why the events “The car was manufactured in Japan” and “The car is a used car” are not mutually exclusive.

Include statistical reasoning in your explanation.

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- (ii) Explain why it can be deduced from this information alone that the car selected is more likely to have been manufactured in Japan than not, given the car selected is a used car.

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## TŪMAHI TUATORU

- (a) Ka heria e ngā tāngata ō rātou waka ki ngā pokapū whakamātautau mō tētahi Warrant of Fitness (WOF).

E toru ngā pokapū whakamātautau i arotakehia inā tata nei i roto i te kotahi marama: te pokapū whakamātautau A, te pokapū whakamātautau B, me te pokapū whakamātautau C. I taua wā, i tuhia ngā otinga katoa mō ngā whakamātautau i mahia i ia pokapū whakamātautau.

40% o ngā whakamātautau i arotakehia i mahia i te pokapū whakamātautau A, ā, 25% o ngā whakamātautau i arotakehia i mahia i te pokapū whakamātautau B.

O ngā whakamātautau i mahia i te pokapū whakamātautau A, 82% i momoho (i hipa i te waka te WOF).

O ngā whakamātautau i mahia i te pokapū whakamātautau B, 96% i momoho.

O ngā whakamātautau i mahia i te pokapū whakamātautau C, 94% i momoho.

- (i) He aha te ōrau o ngā whakamātautau i mahia i te wā o te arotake i momoho?

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- (ii) O ngā whakamātautau kāore i momoho, he aha te ōwehenga i mahia i te pokapū whakamātautau C?

Ka hiahia pea koe ki te whakapae 10 000 ngā whakamātautau i mahia i te wā o te arotake o ngā pokapū whakamātautau e toru.

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**QUESTION THREE**

- (a) People take their cars to testing centres for a Warrant of Fitness (WOF).

Three testing centres were recently reviewed over a one-month period: testing centre A, testing centre B, and testing centre C. During this time, all results for tests completed by each of the testing centres were recorded.

40% of the tests reviewed were completed by testing centre A, and 25% of the tests reviewed were completed by testing centre B.

Of the tests completed by testing centre A, 82% were successful (the car passed the WOF).

Of the tests completed by testing centre B, 96% were successful.

Of the tests completed by testing centre C, 94% were successful.

- (i) What percentage of tests completed during the review were successful?

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- (ii) Of the tests that were unsuccessful, what proportion were completed at testing centre C?  
You may wish to assume that there were 10 000 tests completed during the review of the three testing centres.

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- (iii) I runga i ngā otinga o te arotake, kua whakatau tētahi rangatira waka kia heria atu e ia tōna waka ki te pokapū whakamātautau B kia nui ake tōna tūponotanga ka momoho tana whakamātautau WOF.

Ka taea tēnei whakatau te parahau?

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- (b) E whakaaturia ana ki te papatau i raro ngā kōrero mō te tawhito o ngā waka me ngā motupaika i rēhitatia ki Te Waka Kotahi (NZTA) i te pito o te tau 2013. E whakaatu ana tēnei papatau i ngā kōrero anake mō ngā waka, motupaika rānei e iti ake i te 5 tau te tawhito mai i te pito o te tau 2013.

	Te tawhito o ngā waka i rēhitatia ki te NZTA i te pito o te tau 2013				
	0 tau te tawhito	1 tau te tawhito	2 tau te tawhito	3 tau te tawhito	4 tau te tawhito
Ōwehenga o ngā waka	0.238	0.223	0.188	0.186	0.165
Ōwehenga o ngā motupaika	0.215	0.181	0.177	0.183	0.244

Ka kōwhirihia matapōkeretia tētahi waka me tētahi motupaika mai i ngā waka i rēhitatia ki te NZTA i te pito o te tau 2013.

I te mea he iti ake i te rima tau te tawhito o te waka me te motupaika, whakatau tatahia te tūponotanga he rua tau i te iti rawa te tawhito ake o te motupaika i te waka.

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

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- (iii) Based on the results of the review, a car owner has decided that they should take their car to testing centre B to increase their chances of having a successful WOF test.

Is this decision justified?

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- (b) Information about the ages of cars and motorcycles registered with the New Zealand Transport Agency (NZTA) at the end of 2013 is presented in the table below. This table shows information about only cars or motorcycles less than 5 years old at the end of 2013.

	Age of vehicles registered with NZTA at the end of 2013				
	0 years old	1 year old	2 years old	3 years old	4 years old
<b>Proportion of cars</b>	0.238	0.223	0.188	0.186	0.165
<b>Proportion of motorcycles</b>	0.215	0.181	0.177	0.183	0.244

One car and one motorcycle are chosen at random from vehicles registered with NZTA at the end of 2013.

Given that both vehicles are less than five years old, estimate the probability that the motorcycle is at least two years older than the car.

Support your answer with appropriate statistical statements and calculations.

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*English translation of the wording on the front cover*

## **Level 3 Mathematics and Statistics (Statistics), 2015**

### **91585 Apply probability concepts in solving problems**

2.00 p.m. Thursday 19 November 2015  
Credits: Four

91585M

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
Apply probability concepts in solving problems.	Apply probability concepts, using relational thinking, in solving problems.	Apply probability concepts, 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.**