

See back cover for an English translation of this cover

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91586M



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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2013

91586M Te whakahāngai i ngā tuari tūponotanga hei whakaoti rapanga

9.30 i te ata Rāapa 20 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae 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 Ākongā ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

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

Whakaaturia ngā mahinga KATOĀ.

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

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

Tirohia mehemea kei roto nei ngā whārangi 2–21 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

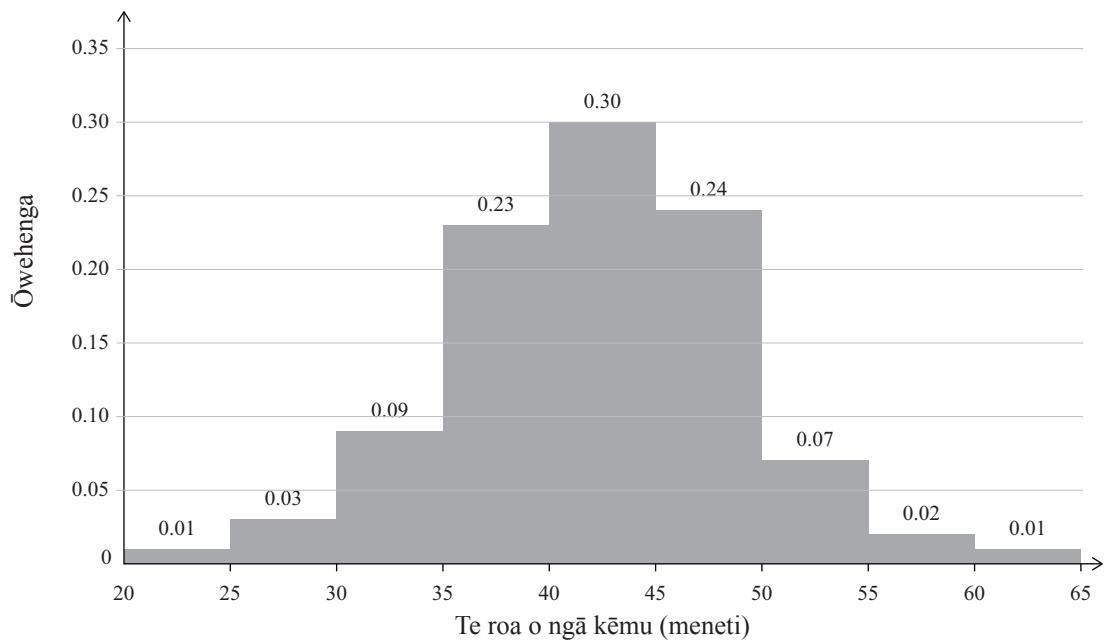
Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

PĀTAI TUATAHI: POIPĀTŪ

- (a) Ko te roa o ngā kēmu poipātū mō tētahi kaitākaro tino toa ka taea te whakatauiria mā te tuari māori, me te toharite o te 44.6 meneti me te ine mahora o te 7.3 meneti.

Tātaihia te ōrautanga o ngā kēmu mō tēnei kaitākaro tino toa e tūmanakohia ka mutu i roto i te 40 meneti, ka roa ake rānei i te 50 meneti.

- (b) Mō tētahi atu kaitākaro tino toa, i kohia ngā raraunga mō te roa o āna kēmu i roto i tētahi wā roa. E whakaatu ana te kauwhata pouhere i raro i ēnei mōhiohio:



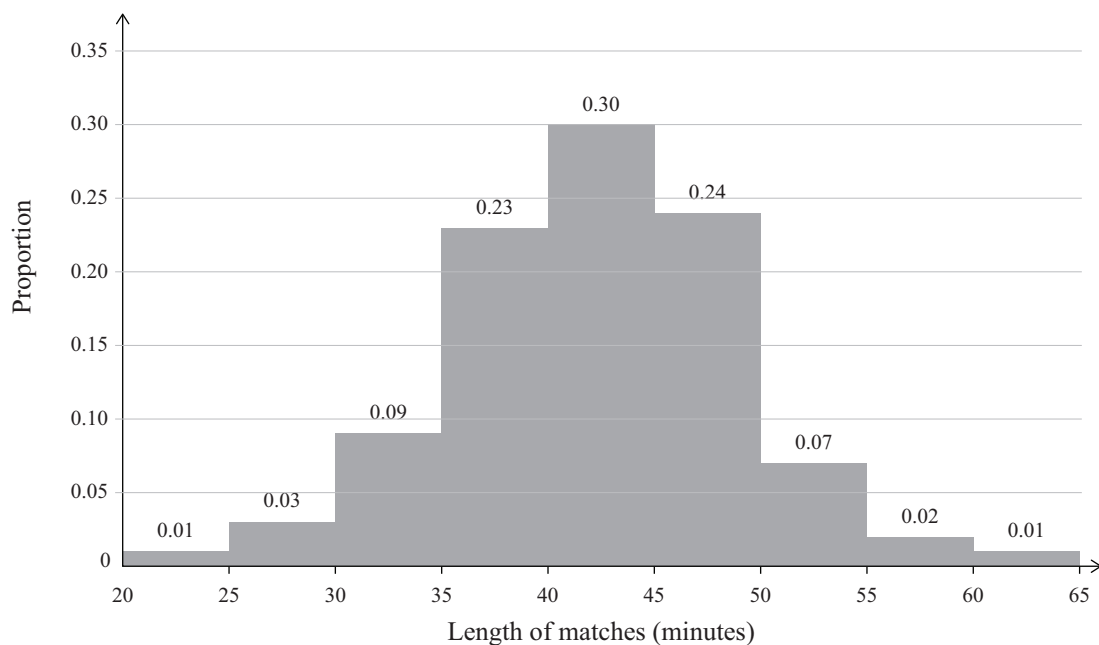
You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE: SQUASH

- (a) The lengths of squash matches for a particular high performance squash player can be modelled by the normal distribution, with a mean of 44.6 minutes and a standard deviation of 7.3 minutes.

Calculate the percentage of matches for this particular high performance squash player that could be expected to last less than 40 minutes or longer than 50 minutes.

- (b) For another high performance player, data on the length of their matches was collected over a long period of time. The histogram below displays this information:



Mō ēnei raraunga, ko te roa toharite o ngā kēmu he 42.2 meneti me te ine mahora o te 6.8 meneti.

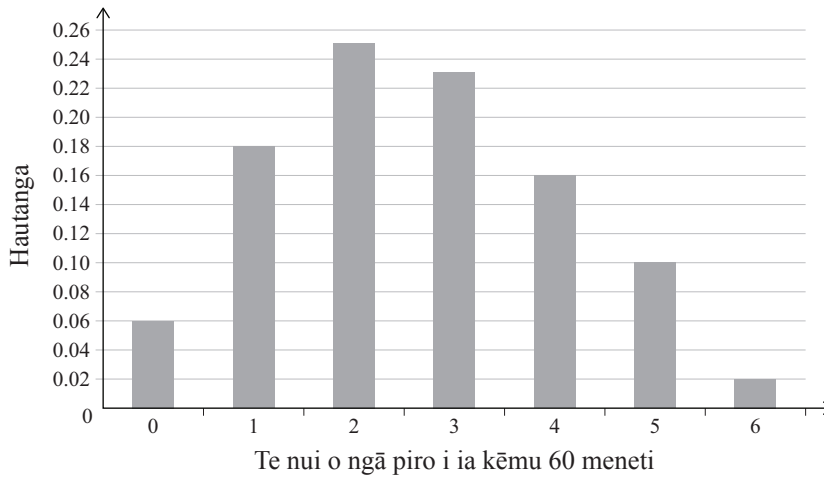
Whakamāramahia mēnā he tōtika ake te tuari māori hei tauira mō te tuaritanga o te roa o ngā kēmu mō te kaitākaro tino toa.

I roto i tō whakautu, whakaahuahia ngā āhuatanga o te tuaritanga me te whakauru i tētahi tātaitanga kotahi i te itinga rawa.

PĀTAI TUARUA: HAUPOI TIO

I roto i te tākaro haupoi tio he tino nui te pāpāhia o te porotaka (te kōpae porohita e hauhauhia ana) i waenga i ngā kapa e rua, ā, tino kore kē nei e tū te karaka i roto i tētahi kēmu o te 60 meneti. He tino ohorere mēnā ka whiwhi piro, ka puta motuhaketia, ā, he ōrite te tūponotanga o te whiwhi piro i ia meneti o te kēmu.

- (a) I puta tēnei kauwhata e whai ake nā ngā mātakitanga o te nui o ngā piro i whiwhi tētahi tīma i roto i tētahi kēmu haupoi tio 60 meneti te roa, i roto i ngā kēmu tino maha.

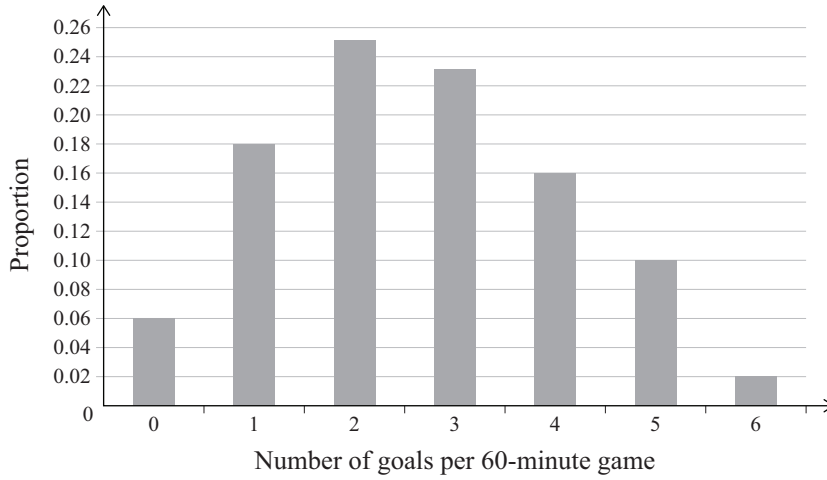


- (i) Whakaahuahia ngā āhuatanga matua o te tuaritanga, me te whiwhi i tētahi whakatau tata mō te nui toharite o ngā piro i roto i tētahi kēmu 60 meneti (ka whakaawhiwhia ki te mati whaiira kotahi).

QUESTION TWO: ICE HOCKEY

Ice hockey is a game where the puck (the round disk that is hit) is passed between the two teams very often, and the clock rarely stops during a 60-minute game. Goals are fairly rare, occur independently, and are approximately equally likely to happen during any minute of the game.

- (a) The observations of the number of goals scored by a team during a 60-minute ice hockey game, over a large number of games, resulted in the following graph.



- (i) Describe the key features of the distribution, and obtain an estimate for the mean number of goals scored per 60-minute game (rounded to one decimal place).

- (ii) After 30 minutes in an ice hockey game involving this team, the team had scored no goals.

Using your answer to part (i) and an appropriate probability distribution to model this situation, calculate the probability of the team scoring at least two goals by the end of the game.

In your answer, you should justify your choice of distribution, identify the parameter(s) of this distribution, and state any assumption(s) you make.

(b) Mō tētahi atu kapa haupoi tio, ko te nui toharite o ngā piro i whiwhi i roto i tētahi kēmu 60 meneti he 0.8.

(i) Tātaihia te tūponotanga i te wā o ngā kēmu 60 meneti rerekē e rua, he iti ake i te toru ngā piro a te kapa i ia kēmu.

Tuhia ō whakatarunatanga.

(ii) Mā te whakamahi i tētahi tuaritanga tōtika, kimihia te tūponotanga ka whiwhi te kapa i ngā piro e toru i te itinga rawa i roto i ngā kēmu e rua i te itinga rawa o ngā kēmu 60 meneti e rima rerekē.

I tō whakautu, tautuhia te tuaritanga me (t)ana tawhā, me te tuhi i (t)ō whakatarunatanga.

(b) For another ice hockey team, the mean number of goals scored per 60-minute game is 0.8.

- (i) Calculate the probability that during two different 60-minute games, the team scores fewer than three goals in each game.

State any assumption(s) you make.

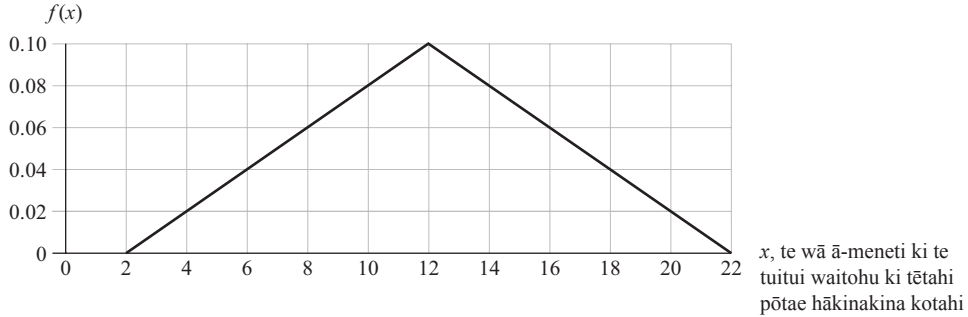
- (ii) Using an appropriate distribution, find the probability that the team will score at least three goals in at least two of the next five different 60-minute games.

In your answer, identify the distribution and its parameter(s), and state any assumption(s) you make.

PĀTAI TUATORU: NGĀ KĀKAHU ŌRITE ME NGĀ UTAUTA

- (a) Ko te kī taurangi a tētahi kamupene tuitui waitohu ki ngā pōtae hākinakina kāore e roa atu i te 22 meneti te mahi i tētahi pōtae kotahi.

E whakatauirā ana i te tuaritanga tapatoru i raro nei i te roa (ā-meneti) ka oti i te kamupene te tuitui waitohu ki tētahi pōtae hākinakina kotahi.



- (i) Tātaihia te tūponotanga ka roa ake te mahi a te kamupene i te 8 meneti ki te tuitui waitohu ki tētahi pōtae hākinakina kotahi.

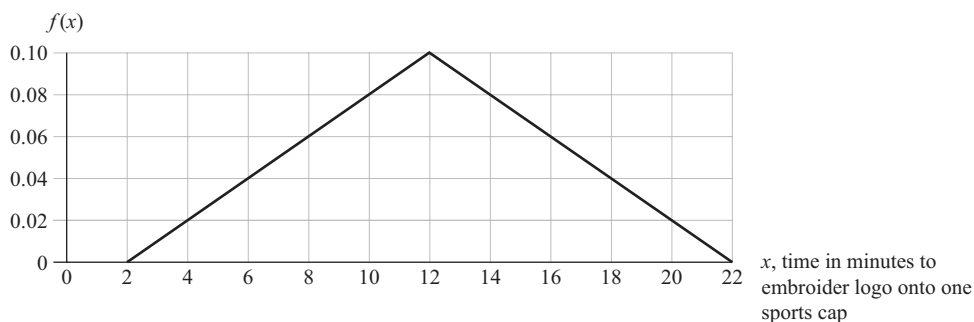
- (ii) I te ekenga o te kotahi tau, ka kohia e te kamupene ngā raraunga mō te roa o tana tuitui waitohu ki tētahi pōtae hākinakina kotahi. I kitea e te kamupene he iti ake i te 8 meneti te wā ka pau mō te tuitui i te waitohu ki te 12% o ngā pōtae. I kitea anō e te kamupene ko ngā wā mōkito, mōrahi hoki ki te tuitui waitohu ki tētahi pōtae hākinakina kotahi he 2 me te 22 meneti.

Me kī ka whakamahia tonuhia tētahi tuaritanga tapatoru hei whakatauirā i te roa ka oti te tuitui waitohu ki tētahi pōtae hākinakina kotahi, kimihia te aratau mō tēnei tuaritanga.

QUESTION THREE: UNIFORMS AND EQUIPMENT

- (a) A company that embroiders logos onto sports caps guarantees that this service will take no longer than 22 minutes for one cap.

The triangular distribution shown below models the time (in minutes) it takes the company to embroider a logo onto one sports cap.



- (i) Calculate the probability that it will take the company more than 8 minutes to embroider a logo onto one sports cap.

- (ii) After a year, the company collected data on the time that it took to embroider a logo onto one sports cap. The company found that it took less than 8 minutes to embroider a logo for 12% of the caps. The company also found that the minimum and maximum times to embroider a logo onto one sports cap were 2 and 22 minutes respectively.

Assuming a triangular distribution is still used to model the time it takes to embroider a logo onto one sports cap, find the mode for this distribution.

- (b) Ka mahia e tētahi kamupene mahi kākahu hākinakina ōrite he hāte mō ngā kapa hākinakina. E mōhio ana te kaiwhakanao ko te mīhini e whakamahia ana ki te mahi i ngā hāte ka whakaputa i ngā hāte tōrōkiri i te 4% o te wā.

Kua whiwhi tonu te kamupene mō ngā hāte 20 mō tētahi kapa hākinakina.

Mā te whakamahi i te tuaritanga tōtika hei whakatauiria i tēnei āhuatanga, tātaihia te tūponotanga e rua ngā hāte tōrōkiri i te itinga rawa i roto i tēnei tonu.

I roto i tō whakautu, me parahau e koe tō kōwhiringa tuaritanga, ka tautuhi i te (ngā) tawhā o tēnei tuaritanga, ka tuhi i te (ngā) whakatarunatanga ka puta i a koe.

- (c) Kua whiwhi amuamu tētahi kamupene mahi rākete poipātū mō tētahi rākete i mahia e ia. E ai ki te amuamu, ko te āhua nei e anga whakarunga kē ana te waitohu rākete kaua ki raro i te hurihanga o te rākete, ā, e whakapaetia ana kei te tahatahi te rākete.

Ko te kī a te kamupene he ōrite te tūponotanga ka anga whakarunga, whakararo rānei te waitohu i muri i te hurihanga o te rākete.

Kua tuhia e te kaiamuamu he raraunga mō ngā hurihanga 20, ā, kei raro e whakaaturia ana.

	Waitohu rākete	
	Anga whakarunga	Anga whakararo
20 ngā hurihanga	13	7

Whakamahia tētahi tuaritanga tūponotanga tōtika hei tūhura mēnā kei te tika te amuamu.

Whakamahia te whakaaro tauanga me ngā tātaitanga hei tautoko i tō whakautu.

- (b) A manufacturer of sports uniforms makes shirts for sports teams. The manufacturer knows that the machine he currently uses to make the shirts will produce defective shirts 4% of the time.

The manufacturer has received an order for 20 shirts for a sports team.

Using an appropriate distribution to model this situation, calculate the probability there will be at least two defective shirts in the order.

In your answer, you should justify your choice of distribution, identify the parameter(s) of this distribution, and state any assumption(s) you make.

- (c) The manufacturer of a brand of squash rackets has received a complaint about a particular racket it produced.

According to the complainant, the racket logo is more likely to be facing up than down after the racket is spun, suggesting that the racket is unbalanced.

The manufacturer states that it is equally likely for the logo to be facing up or down after the racket is spun.

The complainant has recorded data over 20 spins, which is shown in the table below:

	Racket logo	
	Facing up	Facing down
20 spins	13	7

Apply an appropriate probability distribution to investigate whether the complaint is justified. You should support your answer with statistical reasoning and calculations.

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English translation of the wording on the front cover

Level 3 Mathematics and Statistics (Statistics), 2013

91586 Apply probability distributions in solving problems

9.30 am Wednesday 20 November 2013

Credits: Four

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.

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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–STATF.

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 2–21 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.