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91267M



912675



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Te Pāngarau me te Tauanga, Kaupae 2, 2014

91267M Te whakahāngai tikanga tūponotanga hei whakaoti rapanga

2.00 i te ahiahi Rāapa 19 Whiringa-ā-rangi 2014
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakahāngai tikanga tūponotanga hei whakaoti rapanga.	Te whakahāngai tikanga tūponotanga mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai tikanga 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.

Tirohia mēnā kei a koe te Rau Rauemi L2–MATHF.

Whakaaturia ngā mahinga KATOA.

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 2–25 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

PĀTAI TUATAHI

Ina pakeke haere ana te tangata, ka heke haere te kiato o ōna poroiwi¹, ā, e nui ake te tūpono whati o ngā poroiwi.

Ko tētahi tikanga ārai i te whatinga poroiwi ko te kai i ngā tāpiringa kai.

I whakahaeretia he whakamātau haumanu hei whakamātau i te tāpiringa A hou.

I tīpako matapōkeretia tētahi rōpū 2127 te tokomaha mai i ngā tau 50 ki te 70 kia whai wāhi ki tētahi whakamātau mō te tāpiringa hou.

Tata ki te haurua o ngā tāngata i whāngaia ki te tāpiringa A, ā, ko te toenga i whiwhi pire meho (he ōrite te āhua ēngari kāore he pānga hauora).

E whakaaturia ana ngā hua o te whakamātau ki te tūtohi e whai ake:

Maimoatanga	Tokomaha o ngā tāngata		
	Kāore he whatinga	Kotahi te whatinga i te itinga rawa	Tapeke o ngā tāngata
Tāpiringa A	973	92	1065
Pire meho	914	148	1062
Tapeke	1887	240	2127

- (a) (i) He aha te hautanga o ngā tāngata i roto i tēnei whakamātau kāore he whatinga?

- (ii) He aha te hautanga o ngā tāngata i roto i tēnei whakamātau i whāngaia ki te tāpiringa A, ā, kāore he whatinga?

- (b) E hia te ōrau o ngā tāngata i roto i tēnei whakamātau kāore he whatinga i whāngaia ki te pire meho?

¹ kōiwi

- (c) Ko te whakapae ka hauruatia te tūponotanga o te whatinga o te poroiwi mō ngā tāngata i roto i tēnei whakamātau mā te kai i te **tāpiringa A**.

Ka taea tēnei whakapae te parahau mā te tauanga?

Tautokona tō whakautu ki ngā tātainga tōtika.

- (d) E whakapae ana a Ngaire mā te kai i te tāpiringa A ka āhua iti ake te tūponotanga o tētahi whatinga kotahi te itinga rawa mō ngā tāngata i waenga i ngā tau 50 ki te 70. Hei tāna, ko te tikanga, ko te **tāpiringa A** he ārai i te whatinga o te poroiwi i tētahi tangata kotahi i roto i ngā tāngata tata ki te 20 he pērā ō rātou tau.

Kei te tika te whakapae a Ngaire?

Whakamahia ngā otinga o te whakamātau hei tautoko i tō whakautu, me te whakauru i ngā tātainga e hāngai ana.

QUESTION ONE

As people grow older, the density of their bones decreases, making the bones more likely to fracture.

One way to prevent the fracture of bones is to take supplements.

A clinical trial was conducted to test a new supplement A.

A randomly selected group of 2127 people aged between 50 and 70 participated in a trial for the new supplement.

Approximately half of the people were given supplement A, and the rest were given a placebo (which looked the same but had no medical effect).

The results of the trial are shown in the following table.

Treatment	Number of people		
	No fracture	At least one fracture	Total people
Supplement A	973	92	1065
Placebo	914	148	1062
Total	1887	240	2127

- (a) (i) What proportion of people in this trial had no fractures?

- (ii) What proportion of people in this trial were given supplement A and had no fractures?

- (b) What percentage of people in this trial who did not have a fracture were given the placebo?

- (c) A claim is made that taking supplement A halves the risk of having a bone fracture for people in this trial.

Can this claim be justified statistically?

Support your answer with appropriate calculations.

- (d) Ngaire claims that taking supplement A slightly reduces the risk of having at least one fracture for people aged between 50 and 70. She says, in effect, that supplement A prevents one person in approximately 20 such people from having a fracture.

Is Ngaire's claim justified?

Use the results of the trial to support your answer, and include appropriate calculations.

PĀTAI TUARUA

(a) E whakaatu ana ngā whakamātau ko te kiato o te kohuke poroiwi (BMD) o ngā wāhine e 25 ngā tau he mea tata te tuari noa, me te tau toharite o te 950 mg/cm^2 me te ine mahora o te 125 mg/cm^2 .

(i) He aha te tūponotanga kei tētahi wāhine e 25 ōna tau, he nui atu tōna BMD i te 1000 mg/cm^2 ?

(ii) E 25 ngā tau o Jane.
He uara-z o te 0.49 tō tōna BMD.

He aha te inenga BMD ake o Jane?

(iii) He aha te hautanga o ngā wāhine e 25 ngā tau he iti ake ō rātou BMD i tō Jane?

QUESTION TWOASSESSOR'S
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- (a) Tests show that the bone mineral density (BMD) of 25-year-old females is approximately normally distributed, with a mean of 950 mg/cm^2 and a standard deviation of 125 mg/cm^2 .

- (i) What is the probability that a 25-year-old female has a BMD of more than 1000 mg/cm^2 ?

- (ii) Jane is a 25-year-old.
Her BMD has a z -value of 0.49

What is Jane's actual BMD measurement?

- (iii) What proportion of 25-year-old females could be expected to have a BMD that is less than Jane's?

- (b) E whakaatu ana ngā whakamātau ko te BMD o ngā tāne e 25 ngā tau he mea tuari noa, me te ine mahora o te 150 mg/cm^2 .

Mēnā ko 0.656 te tūponotanga he nui ake i te 1000 mg/cm^2 te BMD o tētahi tāne e 25 ngā tau i kōwhiri matapōkeretia, kimihia mai te BMD toharite o ngā tāne e 25 ngā tau.

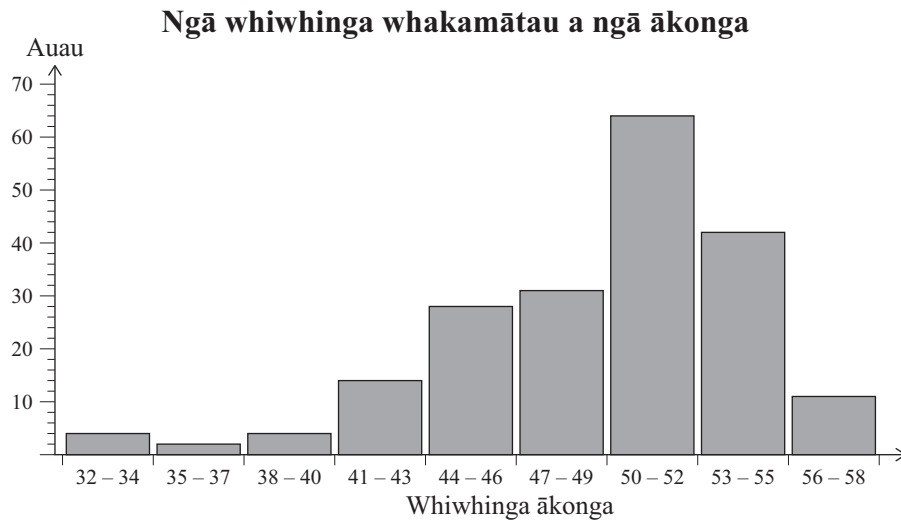
- (b) Tests show that the BMD of 25-year-old males is approximately normally distributed, with a standard deviation of 150 mg/cm^2 .

If the probability that a randomly chosen 25-year-old male has a BMD above 1000 mg/cm^2 is 0.656, find the mean BMD of 25-year-old males.

(c) He rerekē ngā taumata uauatanga o ngā pātai o tētahi whakamātau.

Me whai whakaaro ki ngā kauwhata me ngā tūtohi kei ngā whārangi 10 me te 12.

E whakaatu ana te kauwhata i raro i te tuaritanga o ngā whiwhinga o te whakamātau o ngā ākonga e 200, ā, e whakaatu ana te tūtohi i ngā tauanga hāngai.



Whiwhinga ākonga	Auau
32 – 34	4
35 – 37	2
38 – 40	4
41 – 43	14
44 – 46	28
47 – 49	31
50 – 52	64
53 – 55	42
56 – 58	11
Tapeke	200

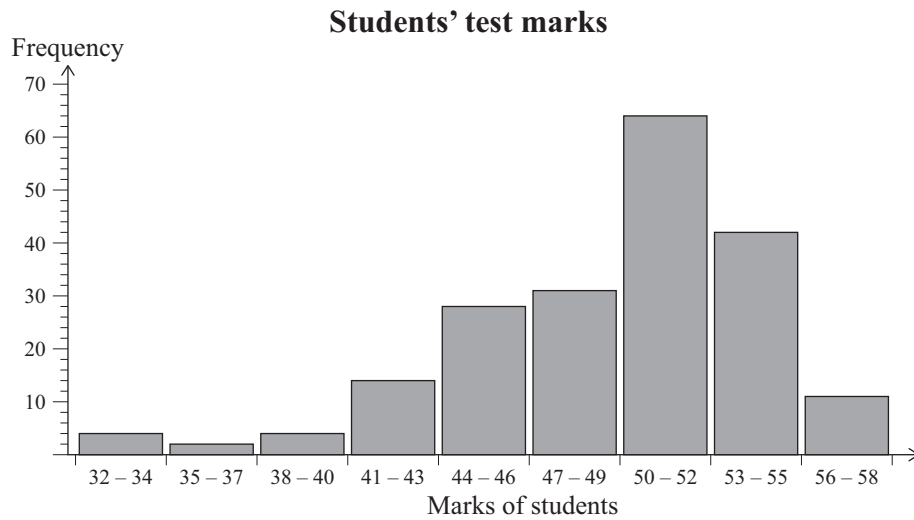
Tauanga	Uara
Toharite	49.775
Mōkito	32
Mōrahi	58
Awhe	26
Ine mahora	4.973

(a) He aha te tūponotanga he iti ake i te 50 ngā whiwhinga o tētahi ākonga ka kōwhiri matapōkeretia?

- (c) A test has questions of varying levels of difficulty.

Consider the graphs and tables shown on pages 11 and 13.

The graph below shows the distribution of the test marks of 200 students, and the table shows some related statistics.



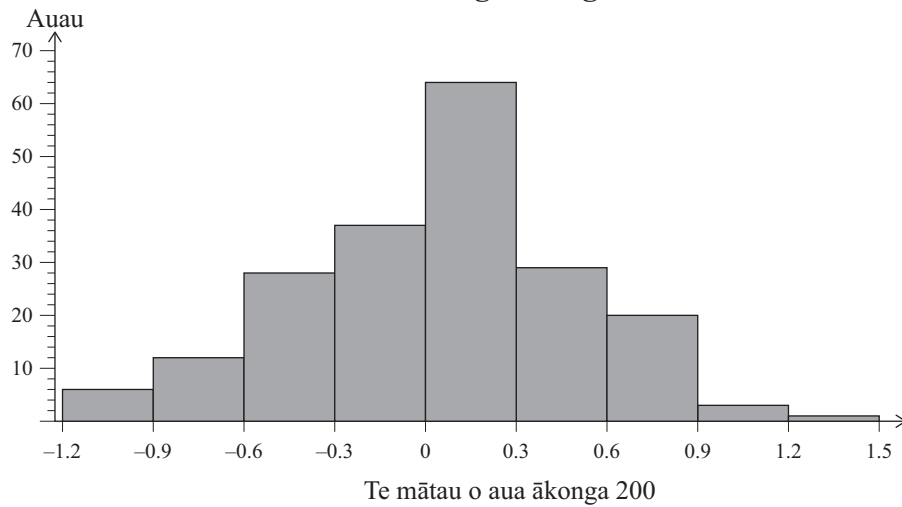
Student marks	Frequency
32 – 34	4
35 – 37	2
38 – 40	4
41 – 43	14
44 – 46	28
47 – 49	31
50 – 52	64
53 – 55	42
56 – 58	11
Total	200

Statistics	Value
Mean	49.775
Minimum	32
Maximum	58
Range	26
Standard deviation	4.973

- (i) What is the probability that a randomly chosen student has a mark less than 50?

E whakaatu ana te hoahoa i raro i te tuaritanga o te mātau o aua ākonga anō, ā, e whakaatu ana te tūtohi i ētahi tauanga hāngai.

Te mātau o ngā ākonga

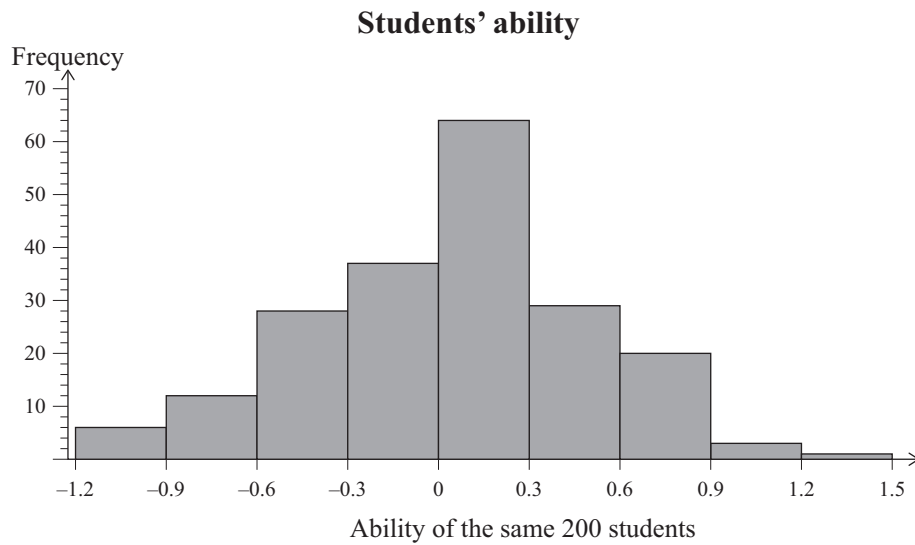


Mātau o te ākonga	Auau
-1.2 –	6
-0.9 –	12
-0.6 –	28
-0.3 –	37
0 –	64
0.3 –	29
0.6 –	20
0.9 –	3
1.2 –	1
Tapeke	200

Tauanga	Uara
Toharite	-0.1065
Mōkito	-1.1
Mōrahi	1.3
Awhe	2.4
Ine mahora	0.465

- (ii) He pēhea te pai o te whakamātau ki te wehewehe i te mātau o ngā ākonga tino matatau? Parahautia tō whakautu.

The graph below shows the distribution of the ability of the same students, and the table shows some related statistics.



Student ability	Frequency
-1.2 –	6
-0.9 –	12
-0.6 –	28
-0.3 –	37
0 –	64
0.3 –	29
0.6 –	20
0.9 –	3
1.2 –	1
Total	200

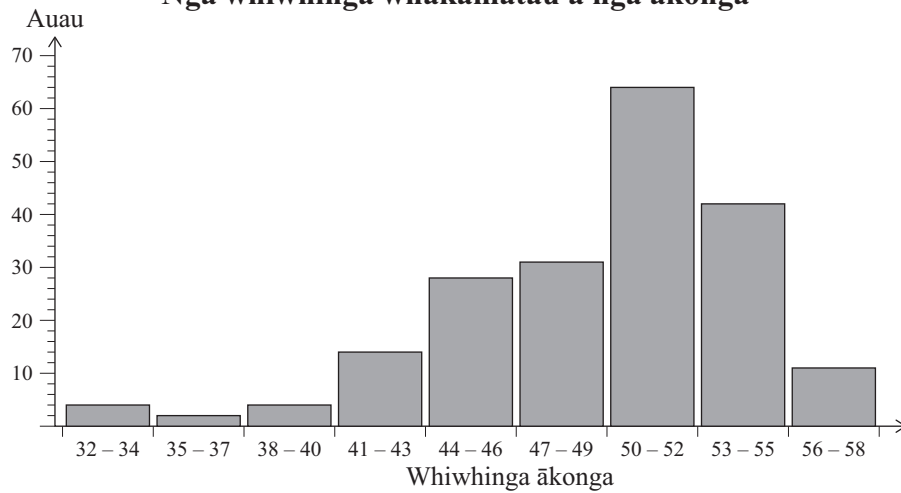
Statistics	Value
Mean	-0.1065
Minimum	-1.1
Maximum	1.3
Range	2.4
Standard deviation	0.465

(ii) How well does the test distinguish the ability of the most able students?

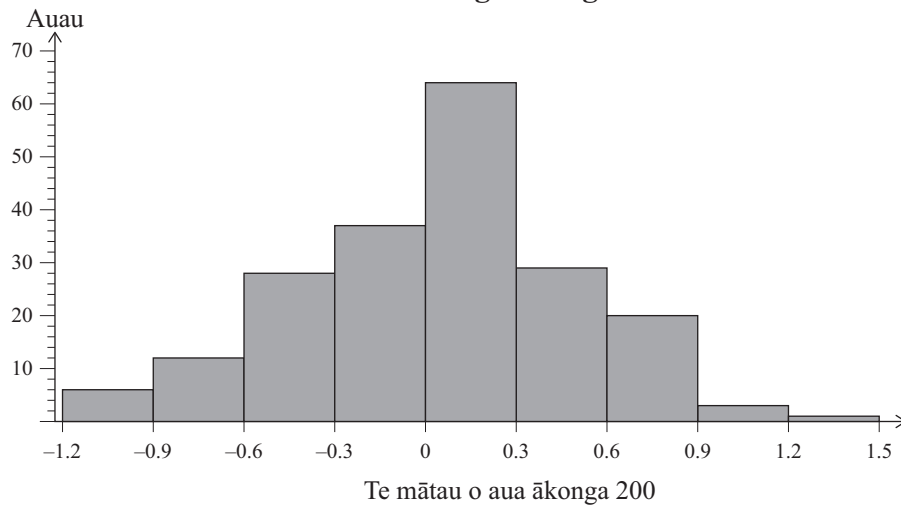
Justify your answer.

- (iii) He mea tārua ngā kauwhata i raro mai i ngā whārangi 10 me te 12.

Ngā whiwhinga whakamātau a ngā ākonga



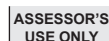
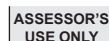
Te mātau o ngā ākonga



Matapakitia ngā tuaritanga.

I tō whakautu me whakauru e koe ētahi tātainga hāngai me ētahi whakatauritenga.
Me matapaki anō e koe te āhua, te pū, me te horanga.

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PĀTAI TUATORU

Kei te tākaro a Matiu rāua ko Whiti i tētahi kēmu me ngā mataono tau tōkeke e rua, kua whai tau mai i te kotahi ki te ono.

Ka tīmata a Matiu mā te pīrori tahi i ngā mataono tau.

Mēnā he 7, 11 rānei te tapeke o ngā tau e whakaaturia ana ki ngā mataono tau, ka toa ko Matiu.

Mēnā he 2, 3, 12, rānei te tapeke o ngā tau e whakaaturia ana ki ngā mataono tau, ka hinga a Matiu.

E whakaatu ana te ripanga i raro nei i te tūponotanga ka taea mō ia tapeke o ngā tau e whakaaturia ana ki ngā mataono tau.

Ngā tūponotanga ka whakaatu te tapeke o ngā tau ki ngā mataono tau

Tapeke	2	3	4	5	6	7	8	9	10	11	12
Tūponotanga	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

(a) He aha te tūponotanga ka hinga a Matiu i te pīrori tuatahi?

(b) He aha te tūponotanga kāore he toa i te pīrori tuatahi?

QUESTION THREE

Matiu and Whiti are playing a game with two fair six-sided dice numbered 1 to 6.

Matiu starts by rolling the two dice together.

If the sum of the numbers showing on the dice is 7 or 11, then Matiu wins the game.

If the sum of the numbers showing on the dice is 2, 3, or 12, then Matiu loses the game.

The table below shows the probability for each possible sum of the numbers showing on the dice.

Probabilities of the sum of the numbers showing on the dice

Sum	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

- (a) What is the probability that Matiu loses on the first roll?

- (b) What is the probability that there is no winner on the first roll?

- (c) Ki te kore a Matiu, a Whiti rānei e toa i te pīrori tuatahi (ehara te tapeke o ngā tau ka whakaaturia ki ngā mataono tau ko te 2, 3, 7, 11, 12 rānei), nō reira ko te tapeke ake o ngā tau kei ngā mataono tau i pīrorihia e Matiu i tana pīrori tuatahi te piro whāinga a Matiu ināianei mō te toenga o te kēmu.

Ka pīrori haere tonu a Matiu kia puta ko te tapeke o ngā mataono tau tana piro whāinga, kia pīrorihia rānei e ia he tapeke 7, ko te mea ka puta tuatahi mai. Kāore a Whiti e pīrori i ngā mataono tau.

Ki te puta mai ko te piro whāinga a Matiu i te tuatahi, ka toa ia; ki te puta tuatahi mai ko te 7, ka toa ko Whiti.

Tērā pea ka whiwhi a Matiu i te tapeke o te 5 i tana pīrori tuatahi.

- (i) He aha te tūponotanga ka toa a Matiu i te pīrori tuarua?

- (ii) He aha te tūponotanga ka toa a Matiu i te pīrori tuatoru?

Ka haere tonu te Pātai
Tuatoru i te whārangi 22.

- (c) If neither Matiu nor Whiti wins the game on the first roll (the sum of the numbers showing on the dice is not 2, 3, 7, 11, or 12), then the actual sum of the numbers showing on the dice that Matiu has thrown on this first roll becomes Matiu's target score for the rest of that game.

Matiu keeps rolling the dice until either the sum on the dice is his target score, or he rolls a sum of 7, whichever occurs first. Whiti does not roll the dice.

If Matiu's target score occurs first, he wins; if a 7 occurs first, then Whiti wins.

Suppose Matiu gets a sum of 5 on the first roll.

- (i) What is the probability Matiu will win the game on the second roll?

- (ii) What is the probability Matiu will win the game on the third roll?

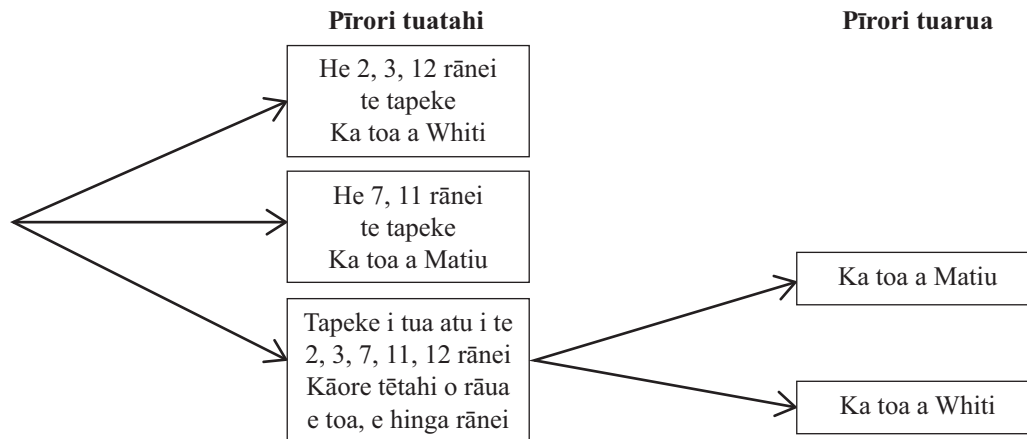
Question Three continues on
page 23.

(d) Ka whakarerekēhia e Matiu rāua ko Whiti te kēmu.

Ko te hiahia mō te kēmu ināianei kia:

- tōkeke
- mutu i muri i ngā pīrori mōrahi e rua.

E whakaatu ana te hoahoa rākau i raro i ngā putanga mō te kēmu kua whakarerekēhia.



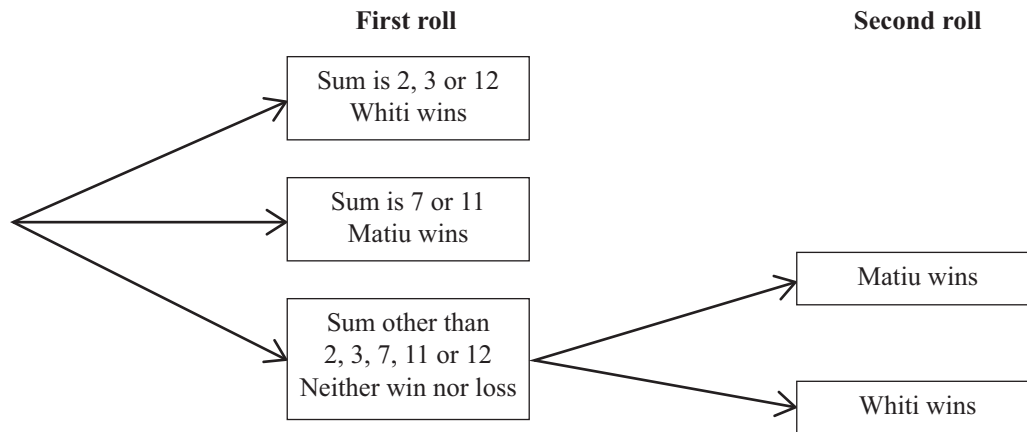
Kimihia te tūponotanga ka toa a Matiu i te pīrori tuarua.

(d) Matiu and Whiti modify the game.

They want the modified game to:

- be fair
- finish after a maximum of two rolls.

The tree diagram below shows the outcomes for the modified game.



Find the probability that Matiu will win on the second roll.

He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tāu pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE
KAIMĀKA
ANAKE

Extra paper if required.
Write the question number(s) if applicable.

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QUESTION
NUMBER

English translation of the wording on the front cover

Level 2 Mathematics and Statistics, 2014

91267 Apply probability methods in solving problems

2.00 pm Wednesday 19 November 2014
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability methods in solving problems.	Apply probability methods, using relational thinking, in solving problems.	Apply probability methods, 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.

Make sure that you have Resource Sheet L2–MATHF.

Show ALL working.

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 2–25 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.

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