3

91585M

915855

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

**QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!**

Tohua tēnei pouaka mēnā KĀORE koe i tuhituhi i roto i tēnei pukapuka

Te Pāngarau me te Tauanga (Tauanga), Kaupae 3, 2021

91585M Te whakamahi ariā tūponotanga hei whakaoti rapanga

Ngā whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakamahi ariā tūponotanga hei whakaoti rapanga.	Te whakamahi ariā tūponotanga mā te whakaaro tūhonohono hei whakaoti rapanga.	Te whakamahi ariā tūponotanga mā te whakaaro waitara 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.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te wāhi wātea kei muri i te pukapuka nei.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–19 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki roto i tētahi wāhi kauruku whakahāngai (✂). Ka tapahia pea tēnei wāhi ina mākahia te pukapuka.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TŪMAHI TUATAHI

Hokona ai e tētahi taiopenga puoro me te kanikani ngā momo tīkiti e rua: Ngā tīkiti ManuMoata me te Kuhunga Tūmatanui. Mō ia momo tīkiti, ka āhei te hunga haere ki te taiopenga i raro i te 16 tau ki te hoko i tētahi tīkiti 'Tamaiti'; i tua atu i tērā me whiwhi tīkiti 'Pakeke'. Me hoko ngā tīkiti ManuMoata i mua i tētahi wā ake, ā, he iti iho te utu o ēnei i ngā tīkiti Kuhunga Tūmatanui. Mō ngā momo tīkiti ManuMoata me te Kuhunga Tūmatanui, he iti iho te utu o ngā tīkiti Tamaiti i ngā tīkiti Pakeke.

Mō te taiopenga 2021, ko te kotahi haurima o ngā tīkiti i hokona he momo ManuMoata. Mō ēnei tīkiti ManuMoata, he toru hauwhā he tīkiti Pakeke.

Mō ngā tīkiti momo Kuhunga Tūmatanui, he rua hautoru o ērā i hokona atu he tīkiti Pakeke.

(a)   Ko te matapae a ngā kaiwhakahaere taiopenga ko te 10% o ngā tīkiti i hokona he tīkiti ManuMoata Tamaiti.

I te tika tā rātau matapae?

(b)   Tātaihia te ōwehenga whānui o ngā tīkiti i hokona atu he tīkiti Pakeke.

(c)   He nui ake te tūponotanga mō tētahi tīkiti Pakeke i hokona atu he tīkiti ManuMoata, he tīkiti Kuhunga Tūmatanui rānei?
       Tautokona tō tuhinga mā ngā tātaitanga.

QUESTION ONE

A music and dance festival sells two types of ticket: EarlyBird and General Admission tickets. For each ticket type, festival attendees under the age of 16 years are able to buy a 'Child' ticket; otherwise an 'Adult' ticket is required. EarlyBird tickets need to be purchased before a particular date, and are cheaper to purchase than General Admission tickets. For both EarlyBird and General Admission ticket types, Child tickets are cheaper than Adult tickets.

For the 2021 festival, one fifth of tickets sold were EarlyBird type. For these EarlyBird tickets, three quarters were Adult tickets.

For General Admission type tickets, two-thirds of those sold were Adult tickets.

(a)   The festival organisers predicted that 10% of their ticket sales would be Child EarlyBird tickets.

    Were they correct in their prediction?

(b)   Calculate the overall proportion of tickets sold that were Adult tickets.

(c)   Was it more likely for an Adult ticket sold to be an EarlyBird ticket or a General Admission ticket?
Support your answer with calculations.

(d) Hei whakatenatena i ngā tāngata kia moata ai te hoko i ā rātau tīkiti, ka whakatau ngā kaiwhakahaere mō te tau 2022 kia whakapikihia te utu o ngā tīkiti Kuhunga Tūmatanui kia nui atu i te utu o ngā tīkiti ManuMoata.

Me mōhio koe mō te tau 2022, ko ngā ōwehenga hāngai o ngā tīkiti Pakeke me te Tamaiti ka hokona atu e tūmanakohia ana ka noho ōrite mō ia momo tīkiti.

Mēnā ka heke te ōwehenga o ngā tīkiti katoa ka hokona hei momo Kuhunga Tūmatanui ki te haurua o te ōwehenga 2021 taketake nā te whakapikitanga o ngā utu o ngā tīkiti Kuhunga Tūmatanui i te tau 2022, me kōrero mō te pānga o tēnei huringa ki te ōwehenga o ngā tīkiti pakeke ka hokona hei momo ManuMoata.

Tautokona tō tuhinga ki ngā whakaaro whaitake, ki ngā tātaitanga hoki/rānei.

(e) Ko tētahi whāinga mō te taiopenga 2022 he whakapiki i te ōwehenga o ngā tīkiti Tamaiti katoa he momo ManuMoata ki te 30%.

Tātaihia te ōwehenga whānui o ngā tīkiti me hoko atu hei tīkiti ManuMoata hei whakapiki i te ōwehenga o ngā tīkiti Tamaiti katoa he momo ManuMoata ki te 30%.

(d) In order to encourage people to buy their tickets early, the organisers decide for 2022 to increase the price of General Admission tickets compared to EarlyBird tickets.

Note that for 2022, the relative proportions of Adult and Child tickets sold are expected to remain the same for each ticket type.

If increasing the price of the General Admission type tickets in 2022 reduces the proportion of all tickets purchased as General Admission type to one half of the original 2021 proportion, comment on the effect of this change on the proportion of adult tickets that are sold as EarlyBird type.

Support your answer with standard reasoning and/or calculations.

(e) An aim for the 2022 festival is to increase the proportion of all Child tickets that were EarlyBird type to 30%.

Calculate the overall proportion of tickets that would need to be sold as EarlyBird tickets in order to increase the proportion of all Child tickets that were EarlyBird type to 30%.

TŪMAHI TUARUA

E toru ngā taiopenga rerekē ka tū i ngā hararei whakatā o te raumati: Idyll, Escapade, me te Serendipity.

(a)   Ka taea ngā rōpū whakaaturanga rerekē, ngā tāngata takitahi rānei (whakatautau) te mātaki ngā taiopenga rerekē. 37 ngā whakatautau puta noa i ngā taiopenga rerekē.

- 17 ngā whakaaturanga a Idyll, 14 ngā whakatautau a Escapade, ā, 29 ngā whakatautau a Serendipity.

- E 5 o aua whakaaturanga ka kitea i Idyll ka tū anō i Escapade.

- 13 o aua whakaaturanga ka kitea i Idyll ka tū anō i Serendipity.

- E 3 ngā whakaaturanga ka taea te mātaki i ngā taiopenga katoa e toru.

(i)   Tātaihia te ōwehenga o ngā whakaaturanga i Idyll ka tū ki taua taiopenga anake (ka taea anake te mātaki i Idyll).

(ii)   Ko ēhea ngā taiopenga e rua he nui ake te tūponotanga ka kitea e te tangata aua whakaaturanga anō?

Tautokona tō tuhinga ki ngā tauākī tauanga.

QUESTION TWO

Three different festivals are operating over the summer holiday break: Idyll, Escapade, and Serendipity.

(a) Different performing groups or individuals (acts) can be seen at the different festivals. There are 37 acts performing across the three festivals.

- Idyll offers 17 acts, Escapade offers 14 acts, and Serendipity offers 29 acts.

- 5 of the acts seen at Idyll also perform at Escapade.

- 13 of the acts seen at Idyll also perform at Serendipity.

- 3 acts can be seen at all three festivals.

(i) Calculate the proportion of acts at Idyll that are unique to that festival (can be seen only at Idyll).

(ii) Which two festivals have the greatest probability of people seeing the same acts?

Support your answer with statistical statements.

(iii) Kotahi anake te taiopenga ka taea e tētahi tangata te utu. Kei te hiahia ia ki te haere ki te taiopenga e nui ake ai te tūponotanga o te kite i tētahi whakatautau ahurei (tētahi kāore e kitea i tētahi atu taiopenga).

Ko tēhea te taiopenga me kōwhiri ia kia tae ā-tinana?

Tautokona tō tuhinga ki te whakaaro whaitake o te tauanga.

(b) Mō te hunga ka tae ki te taiopenga kotahi noa iho, kua hangaia he tauira e matapae ana i te taiopenga ka kōwhiria e te tangata hei tae atu, e ai ki ngā tūmomo āhuatanga o taua tangata, tae atu ki ngā taurangi pērā i te taipakeke, moni whiwhi me te wāhi noho. Hei whakamātau i te tauira, 214 ngā tāngata i uiuitia, ā, i whakatauritea te momo taiopenga ake i tīpakohia e ia tangata ki te taiopenga i matapaetia e te tauira.

E whakaatu ana te tūtohi i raro i ngā otinga o tēnei rangahau.

Taiopenga ake	Taiopenga i matapaetia		
	Idyll	Escapade	Serendipity
Idyll	80	15	2
Escapade	7	25	33
Serendipity	15	32	5

(i) Tātaihia te ōrau o ngā matapae i te tika (he ōrite te taiopenga i matapaetia ki te taiopenga ake i tīpakohia mō taua tangata).

(iii) A particular festival attendee can afford to attend only one festival. They wish to attend the festival that will give them the highest probability of seeing a unique act (one not able to be seen at a different festival).

Which festival should they choose to attend?

Support your answer with statistical reasoning.

(b) For people who attend only one festival, a model has been developed that predicts the festival a person will choose to attend, based on various characteristics of that person, including variables such as age, income, and home location. To test the model, a group of 214 people were surveyed and the actual festival chosen by each person was compared to the predicted festival from the model.

The table below shows the results of this survey.

Actual Festival	Predicted Festival		
	Idyll	Escapade	Serendipity
Idyll	80	15	2
Escapade	7	25	33
Serendipity	15	32	5

(i) Calculate the percentage of the predictions that were correct (the predicted festival was the same as the actual festival chosen for that person).

(ii)   Me kōrero mō te tōtika o te tauira hei matapae i te haere atu ki ngā taenga rerekē.

Tautokona tō tuhinga mā tētahi atu tātaitanga.

_____

_____

_____

_____

_____

_____

_____

_____

(c)   He kerewēne kai tā Patrick, e hoko ana i ngā kai me ngā inu i ngā taiopenga. Ka hokona tōpūtia mai e ia ngā kēne inu 300, ā, he mea pānui he ōrite te ōwehenga o te whakarato i ngā reka kora, namuneiti me te ārani. Ko te kora te reka e tino hiahiatia ana e te hunga haere ki ngā taiopenga, ā, ka pōuri a Patrick i tana tatautanga e 85 anake ngā inu kora kei roto i ana kēne 300.

Ko te whakaaro o Patrick kāore e kore he tīpako tōtika tana mōkī inu tōpū nō ngā inu ka mahia e te kaiwhakanao. Ka whakaaro ake ia mēnā he iti iho te ōwehenga o ngā inu kora kua whakaratoa i tērā kua pānuitia.

Me matapaki he pēhea te āwhina a te whakahaere i tētahi whakataruna i a Patrick ki te whiriwhiri mēnā e tohu ana tana mōkī inu tōpū i te ōwehenga o ngā inu kora e whakaratoa ana e te kaiwhakanao he iti iho i te kotahi hautoru.

I roto i tō tuhinga, me whakaahua ngā whakaaturanga ka kimihia e Patrick i roto i tana whakataruna hei parahau i te tuku amuamu ki te kaiwhakanao.

Hei aha te hoahoa i te whakataruna.

_____

_____

_____

_____

_____

_____

_____

(ii) Comment on the appropriateness of the model for predicting attendance at the different festivals.

Support your answer with at least one additional calculation.

(c) Patrick owns a food caravan, and sells food and drinks at festivals. He purchases a bulk pack of 300 canned drinks, which were advertised as being supplied in equal proportions of cola, lemonade, and orange flavours. Cola is usually the preferred flavour for festival attendees, so consequently Patrick is disappointed when he counts that there are only 85 cola drinks in his pack of 300 cans.

Patrick thinks that his bulk pack is likely to be a representative sample of drinks produced by the manufacturer. He wonders if the proportion of cola drinks supplied is less than the advertised proportion.

Discuss how carrying out a simulation would help Patrick consider whether his bulk pack could indicate that the proportion of cola drinks supplied by the manufacturer is less than one third.

As part of your answer, describe what evidence Patrick would look for in his simulation that would justify making a complaint to the manufacturer.

You do not need to design the simulation.

TŪMAHI TUATORU

Ka hokona ngā tīkiti taiopenga i runga ipurangi, i tētahi tari tīkiti i te wāhi rānei. Kua whakaemihia e ngā kaiwhakahaere ngā raraunga mai i ngā tāngata 1000 tuatahi o te taiopenga i hoko i a rātau tīkiti i runga ipurangi. E whakamārama ana ngā raraunga i te taipakeke o te hunga haere ki te taiopenga (kei raro i te 25 tau, 25 tau rānei, pakeke ake hoki), me tō rātau tino hiahia ki te haere ki te taiopenga (kanikani, whakawhanaunga, 'tētahi atu' rānei).

750 o te hunga haere ki te taiopenga kei raro i te 25 tau. Ko te hiahia matua o te 510 o ēnei he kanikani. Ko te nuinga atu o te hunga haere tamariki ake he ōrite te wehenga i waenga i a rātau e hiahia ana ki te whakawhanaunga rātau, rānei e kaingākau ana ki ētahi atu pūtake.

Kō rātau he pakeke ake i te 25 tau, 160 o ēnei e tino kaingākau ana ki te whakawhanaunga. O te nuinga atu o te hunga haere he pakeke atu, 60% kei te tino kaingākau ki te kanikani.

Ka tīpako matapōkeretia tētahi tangata haere ki te taiopenga.

(a)   Tātaihia te tūponotanga ko te tangata haere ki te taiopenga kei raro i te 25 tau, ā, e tino kaingākau ana ia ki te whakawhanaunga.

(b)   Ko te whakapae a ngā kaiwhakahaere o te taiopenga he rearua ake te tūponotanga e tino kaingākau ana te hunga whai wāhi mai he tamariki ake (kei raro i te 25 tau) ki te kanikani tēnā i te hunga pakeke ake (25 tau, pakeke ake rānei).

Kei te tautoko ēnei raraunga i te whakapae a ngā kaiwhakahaere taiopenga?

Tautokona tō tuhinga ki te taunakitanga tauanga.

QUESTION THREE

Festival tickets are sold either online or through a ticket office at the venue. The organisers have gathered data from the first 1000 festival attendees to buy their tickets online. The data summarises the age of the festival attendees (less than 25 years old, or 25 years old and over), and their main motivation for attending the festival (dancing, socialising, or 'other').

750 of the festival attendees are less than 25 years old. The main motivation of 510 of these is to dance. The remainder of these younger attendees are evenly split between those mainly interested in socialising, or those mainly interested for other reasons.

For those older than 25 years old, 160 are mainly interested in socialising. Of the remainder of the older attendees, 60% are mainly interested in dancing.

A festival attendee is chosen at random.

(a) Calculate the probability that the festival attendee is less than 25 years old and is mainly interested in socialising.

(b) Festival organisers claim that it is at least twice as likely for younger participants (less than 25 years old) to be mainly interested in dancing compared to older participants (25 years or older).

Does this data support the festival organisers' claim?

Support your answer with statistical evidence.

(c) (i) He motuhake ngā pāpono 'ko te tangata haere ki te taiopenga kei raro iho i te 25 tau', ā, 'kei te tino kaingākau ki te kanikani'?

Tautokona tō tuhinga ki te whakaaro whaitake o te tauanga.

_____

_____

_____

_____

(ii) Whakamāramatia tō tuhinga i te wāhanga (i) e ai ki te pātahitanga i waenga i ngā pāpono 'ko te tangata haere ki te taiopenga kei raro i te 25 tau', ā, te 'kei te tino kaingākau ki te kanikani'.

_____

_____

_____

_____

_____

(d) Tuhia kia RUA ngā take hei kōrero whakatūpato i te whakamahinga o ngā raraunga e matapae ana ko te tangata tae atu ki te taiopenga, kei raro iho i te 25 tau.

_____

_____

_____

_____

_____

_____

_____

(c) (i) Are the events 'festival attendee is less than 25 years old' and 'festival attendee is mainly interested in dancing' independent?

Support your answer with statistical reasoning.

(ii) Interpret your answer in part (i) in terms of the relationship between the events 'festival attendee is less than 25 years old' and 'festival attendee is mainly interested in dancing'.

(d) Give TWO reasons why care should be taken when using this data to predict that a new ticket purchaser buying a ticket will be less than 25 years old and mainly interested in dancing.

TAU TŪMAHI

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

<div style="border:1px solid black">

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

</div>

QUESTION
NUMBER

Level 3 Mathematics and Statistics (Statistics) 2021

91585M Apply probability concepts in solving problems

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
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 extra space provided at the back of this booklet.

Check that this booklet has pages 2 – 19 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.