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91585M

915855

Tuhia he (☒) ki te pouaka mēnā kāore koe i tuhi kōrero ki tēnei puka

NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pāngarau me te Tauanga (Te Tauanga), Kaupae 3, 2024

91585M Te whakahāngai ariā tūponotanga i te whakaoti rapanga

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakahāngai ariā tūponotanga i te whakaoti rapanga.	Te whakahāngai ariā tūponotanga, mā roto i te whakaaro pānga, i te whakaoti rapanga.	Te whakahāngai ariā tūponotanga, mā roto i te whakaaro waitara e whānui ana, i te whakaoti rapanga.

Tirohia kia kitea ai 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.

Tirohia kia kitea ai kei a koe te Puka mō ngā Ture Tātai me ngā Tūtohi L3–STATMF.

Whakaaturia ngā whiriwhiringa KATOA.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–27, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (⁘). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TE TŪMAHI TUATAHI

(a) Ka whakamahi ngā kaiwhakaako i ngā pūoko tuhi pēnei i te Turnitin kia kite ai mēnā kua whakamahi ngā ākonga i te AI (te Atamai Hangahanga) hei tuhi i ā rātou taumahi. Ka hoahoatia ana ngā pūoko tuhi, ka aro ngā kaipūtaiao ki te tika; ina kīia he tuhinga AI e kitea ana i tētahi tūmahi, me mōhio pū kua waihangatia te mahi e te AI, e kore ai e hē te whakapaetia o te ākonga mō te reho o ana mahi. Nā reira, kāore pea te pūoko e kite i ngā tuhituhi AI katoa; ka mahue pea ētahi.

Ko te kitenga hētanga i ngā kitenga tuhituhi AI, ko te hē o te tautuhi i ngā kōrero kua tuhia katoatia e te tangata hei kōrero kua waihangatia e te AI. Me kī, ko te 1% te pāpātanga ka hē te kitea o tā te AI mahi e tētahi pūoko tuhi AI, engari i te 74% o te wā, ka mahue te kitea o ngā tuhinga kua waihangatia e te AI.

E ai ki tētahi rangahau matatapu o ngā ākonga i tā tētahi kaiako akoranga, e whakaarotia ana kei te whai wāhi atu ngā kōrero kua waihangatia e te AI ki te 22% o ngā tuhinga a ngā ākonga.

(i) Ki te matawaitia ngā tuhinga 120 e tēnei pūoko AI, e hia katoa, hei whakataunga tata, ka kitea kua waihangatia pea e te AI?

(ii) Kua kitea te waihangatia pea o tētahi tuhinga e te AI.

Tuhia mēnā rānei me māharahara te kaiako ki te tōkeke-kore o te kīia o te ākonga he tinihanga.

Taunakitia tō tuhinga ki ngā whakaaro ā-tauanga.

QUESTION ONE

(a) Educators use writing detectors like Turnitin to detect if students have used AI (Artificial Intelligence) to write their assignments. When designing writing detectors, scientists focus on accuracy; if they say AI writing is present in a piece of work, they want to be pretty certain that the work is AI-generated, to ensure that students are not falsely accused of misconduct. This means that the detector may not always detect all AI writing; some may be missed.

A false positive in AI writing detection refers to incorrectly identifying fully human-written text as AI-generated. Suppose that a particular AI writing detector has a 1% false positive rate but that 74% of the time it fails to detect AI-generated writing.

Based on a confidential survey of students in one teacher's course, it is thought that 22% of pieces of student writing contain content that is generated by AI.

(i) If 120 pieces of writing are screened by this AI detector, approximately how many would be detected as potentially being generated by AI?

(ii) A piece of writing is detected as potentially being generated by AI.

Comment on whether a teacher should be concerned that the student could be unfairly accused of cheating.

Support your answer with statistical reasoning.

(b) I ōna wā, ka māharahara ngā kaiwhakahaere whakamātautau kua tinihanga pea ngā ākonga ka whakaoti wawe i ngā whakamātautau. E ai ki ngā raraunga i kohia rā i tētahi kura, mō tētahi paerewa NCEA e 60 meneti te wā tāpui, e mōhiotia ana:

- 1% o ngā ākonga ka tinihanga i te whakamātautau mō tēnei paerewa
- E 20% o ngā ākonga ka whakaoti i te whakamātautau i roto i te 25% o te wā tāpui
- E 80% o ngā ākonga e tinihanga ana ka whakaoti i te whakamātautau i roto i te 25% o te wā tāpui.

(i) Tuhia he kōrero mō te motuhake rānei o ngā pāpono o ‘ka tinihanga te ākonga’ me ‘ka whakaoti te ākonga i te whakamātautau i roto i te 25% o te wā tāpui’.

Whakamahia ngā whakaaro ā-tauanga hei tautoko i tō tuhinga.

Whakamāoritia HOKI tō tuhinga e ai ki te pānga i waenganui i ngā pāpono o ‘ka tinihanga te ākonga’ me ‘ka whakaoti te ākonga i te whakamātautau i roto i te 25% o te wā tāpui’.

(ii) Me whakatau tata te hautanga o ngā ākonga puta noa i Aotearoa ka tinihanga, ā, ka whakaoti i te whakamātautau mō tēnei paerewa i roto i te 25% o te wā tāpui.

(b) Exam supervisors are sometimes concerned that students who complete tests quickly might have cheated. Based on data collected from one school, for a particular NCEA standard with an allocated time of 60 minutes, it is known that:

- 1% of students cheat on the assessment for this standard
- 20% of students complete the assessment in less than 25% of the allocated time
- 80% of students who cheat on the assessment complete it in less than 25% of the allocated time.

(i) Comment on whether the events, 'student cheats' and 'student completes the assessment in less than 25% of the allocated time', are independent of each other.

Use statistical reasoning to support your answer.

AND interpret your answer in terms of the relationship between the events 'student cheats' and 'student completes the assessment in less than 25% of the allocated time'.

(ii) Estimate the proportion of students across New Zealand who cheat and complete the assessment for this standard in less than 25% of the allocated time.

(iii) Homai ngā take e RUA me āta whakamahi ēnei raraunga hei whakatau tata i te hautanga o ngā ākonga e whakamātauria ana mō te NCEA ka tinihanga, ā, ka whakaoti i te whakamātautau i roto i te 25% o te wā tāpui.

Te take tuatahi:

Te take tuarua:

(iii) Give TWO reasons why care should be taken when using this data to estimate the proportion of students being assessed for NCEA who will cheat and complete the assessment in less than 25% of the allocated time.

Reason one:

Reason two:

TE TŪMAHI TUARUA

(a) Whakaarotia ai te mātai raraunga hei pūtahitanga mō ngā huinga pūkenga matua e toru: mō te tuhiwaehere, mō ngā mōhiotanga pāngarau me te tauanga, me ngā māramatanga marau (ngā kaupapa whāiti rānei), pēnei i te ahumoni, i te mātai koiora, me te hauora.

Mai i ngā tono e 35 mō tētahi tūranga mātai raraunga, i hiahiatia ai ngā huinga pūkenga e toru, e mōhiotia ana ngā pārongo e whai ake nei:

- E 7 ngā kaitono kāore i a rātou tētahi o ngā huinga pūkenga e toru
- E 21 ngā kaitono he pūkenga tuhiwaehere ō rātou
- 16 ngā kaitono he mōhiotanga pāngarau me te tauanga ō rātou
- E 6 ngā kaitono i a rātou ngā māramatanga kaupapa-whāiti e tika ana
- E 9 ngā kaitono i a rātou ngā pūkenga e rua pū o ngā huinga pūkenga matua e toru
- E 7 ngā kaitono he kaitono pai mō te tūranga engari kāore i a rātou ngā māramatanga e whāiti ana ki ngā kaupapa
- 1 te kaitono i a ia ngā māramatanga anake e whāiti ana ki ngā kaupapa
- o te hunga kotahi anake te huinga pūkenga matua, he mōhiotanga anake ō te $\frac{3}{8}$ ki te pāngarau me te tauanga.

he wāhi mō ngā whiriwhiringa

(i) I waihangatia tētahi rārangi poto o ngā tāngata i a rātou ngā huinga pūkenga e toru.

E hia ngā kaitono i whiriwhiria mō te rārangi poto?

(ii) Tātaihia te hautanga o ngā kaitono kotahi anake te pūkenga me mātua whai.

(iii) E whakapaetia ana, mō ērā kaitono kei a rātou ngā mōhiotanga mō te pāngarau me te tauanga me mātua whai, e rua whakareanga te nui ake o te tūponotanga kei ngā kaitono ngā māramatanga e whāiti ana ki ngā kaupapa, tēnā i ngā pūkenga tuhiwaehere.

Ka tautoko rānei ēnei raraunga i te whakapae?

Whakamahia ngā tātaihanga me ngā whakaaro ā-tauanga hei tautoko i tō tuhinga.

QUESTION TWO

(a) Data science is commonly thought of as the intersection of three main skill sets: coding, mathematical and statistical knowledge, and domain (or subject-specific) understanding, e.g. finance, biology, health.

From 35 applications for a data science role, where all three skill sets were desired, the following information is known:

- 7 applicants had none of the three skill sets
- 21 applicants had coding skills
- 16 applicants had mathematical and statistical knowledge
- 6 applicants had the necessary subject-specific understanding
- 9 applicants had exactly two of the three main skill sets
- 7 applicants were good candidates for the role except that they didn't have any subject-specific knowledge
- 1 applicant had only subject-specific understanding
- out of those with only one main skill set, $\frac{3}{8}$ had only mathematical and statistical knowledge.

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(i) A shortlist of people with all three skill sets was created.

How many applicants were selected for the shortlist?

(ii) Calculate the proportion of applicants who had only one of the required skills.

(iii) It is claimed that, for those applicants with the required mathematical and statistical knowledge, applicants are twice as likely to have subject-specific understanding compared to coding skills.

Does this data support the claim?

Use calculations and statistical reasoning to support your answer.

(b) ‘I te tau 2022, i whakawhiwhia te 82.4% o te hunga 18 tau te pakeke ki tētahi tohu e ōrite ana ki te Taumata 2 o NCEA, ki tētahi taumata o runga ake rānei. O ērā kua 18 tau te pakeke i te tau 2022, e 78.3% i whakawhiwhia ki te Taumata 2 o NCEA, ki tētahi taumata o runga ake rānei, i te kura, ā, e 4.1% i whakawhiwhia ki te Taumata 2 o NCEA, ki tētahi taumata o runga ake rānei, i muri i te putanga i te kura, i tētahi kura tuatoru, i tētahi akoranga ringarehe rānei.’

Te Ata 1: Ko te nuinga o te hunga 18 tau te pakeke i whakawhiwhia ai ki te Taumata 2 o NCEA, ki tētahi taumata o runga ake rānei, i whakawhiwhia ki ō rātou tohu i te kura

Te mātāpuna: www.educationcounts.govt.nz/statistics/18-year-olds-with-level-2-or-equivalent

(i) I runga i ngā raraunga, kei te tika rānei te whakapae kua piki te hautanga tapeke o te hunga 18 tau te pakeke kua whakawhiwhia ki te Taumata 2 o NCEA i waenganui i te tau 2012 me te tau 2022?

Taunakitia tō tuhinga ki ngā whakaaro ā-tauanga.

(ii) Tuhia he kōrero mō te whai wāhi atu o ngā tohu i muri i te putanga i te kura ki te hautanga tapeke o te hunga 18 tau te pakeke kua whakawhiwhia ki te Taumata 2 o NCEA, ki tētahi taumata o runga ake rānei, i waenganui i te tau 2012 me te tau 2022.

Taunakitia tō tuhinga ki ngā whakaaro ā-tauanga.

(b) ‘In 2022, 82.4% of all 18-year-olds attained the equivalent of NCEA Level 2 or above. Of those who turned 18 in 2022, 78.3% of them attained at least NCEA Level 2 or above in school, and 4.1% of them attained at least NCEA Level 2 or above post-school in a tertiary or vocational setting.’

Figure 1: Most 18-year-olds with NCEA Level 2 or above attained their qualification in school

Source: www.educationcounts.govt.nz/statistics/18-year-olds-with-level-2-or-equivalent

(i) Based on the data, is the suggestion that the total proportion of 18-year-olds with NCEA Level 2 has increased between 2012 and 2022 correct?

Support your answer with statistical reasoning.

(ii) Comment on the contribution of post-school qualifications to the total proportion of 18-year-olds with NCEA Level 2 or above between 2012 and 2022.

Support your answer with statistical reasoning.

TE TŪMAHI TUATORU

(a) Ka tākaro tētahi kaitākaro i ngā kēmu rerekē e rua, i te A me te B, mā te pīrori i ētahi mataono e rua.

(i) Mō te kēmu A, mēnā ka tau te tapeke o ngā pīrorihanga e rua o te mataono ki waenganui i te 5 me te 10 (hui katoa), ka toa te kaitākaro.

Tātaihia te tūponotanga ka kotahi, ka neke atu rānei, ngā toanga a tētahi kaitākaro mēnā ka toru ana tākaro.

QUESTION THREE

(a) A player plays two different games, A and B, by rolling a pair of dice.

(i) For game A, if the total of two dice rolls is between 5 and 10 (inclusive), then the player wins.

Calculate the probability that a player wins at least once when playing 3 times.

(ii) Mō te kēmu B, ka tākarohia tētahi momo o te kēmu e kīia nei ko Mōrearea. E whai ake nei ko ngā ture o tēnei kēmu:

- Ka pīrorihia ana e te kaitākaro ngā mataono mō te wā tuatahi, he toanga mēnā ko te 7 te tapeke o ngā mataono e rua, ahakoa te whiriwhiringa.
- I te pīrorihanga tuatahitanga, he hinganga wawe mēnā ko te tapeke o ngā mataono, ko te 2, ko te 3, ko te 11, ko te 12 rānei.
- Ki te kore tētahi e toa, e hinga rānei i te pīrorihanga tuatahitanga, ka kīia te tapeke o ngā mataono, ko te poita.
- Mō ngā pīrorihanga katoa o muri mai, ka toa te kaitākaro i tētahi kēmu mēnā ka puta anō te poita i te pīrorihanga. Engari, ki te pīrorihia te 7 i mua i te putanga o te poita, ka hinga te kaitākaro.

Tātaihia te tūponotanga kua hinga kē te kaitākaro i te kēmu i mua i te pīrorihanga tuatorutanga a te kaitākaro i te mataono.

(ii) For game B, a version of the game called Hazard is played. The rules of this game are as follows:

- When a player rolls the dice for the first time, any combination of the two dice that adds up to 7 is a winner.
- On the first roll, any dice total that equals 2, 3, 11, or 12 is an immediate loser.
- If the first roll has not produced a winner or a loser, the total of the dice becomes known as the point.
- For all successive rolls, the player will win a game if the point is rolled again. However, if a 7 is rolled before the point is rolled, the player loses.

Calculate the probability that the game is lost before the player has to roll the dice for a third time.

(b) E māharahara ana te kaitākaro ki te haukume rānei o tētahi o āna mataono. Kua whakarāpopotohia ngā putanga o ngā pīrorihanga 1000 o tēnei mataono ki te tūtohi o raro nei.

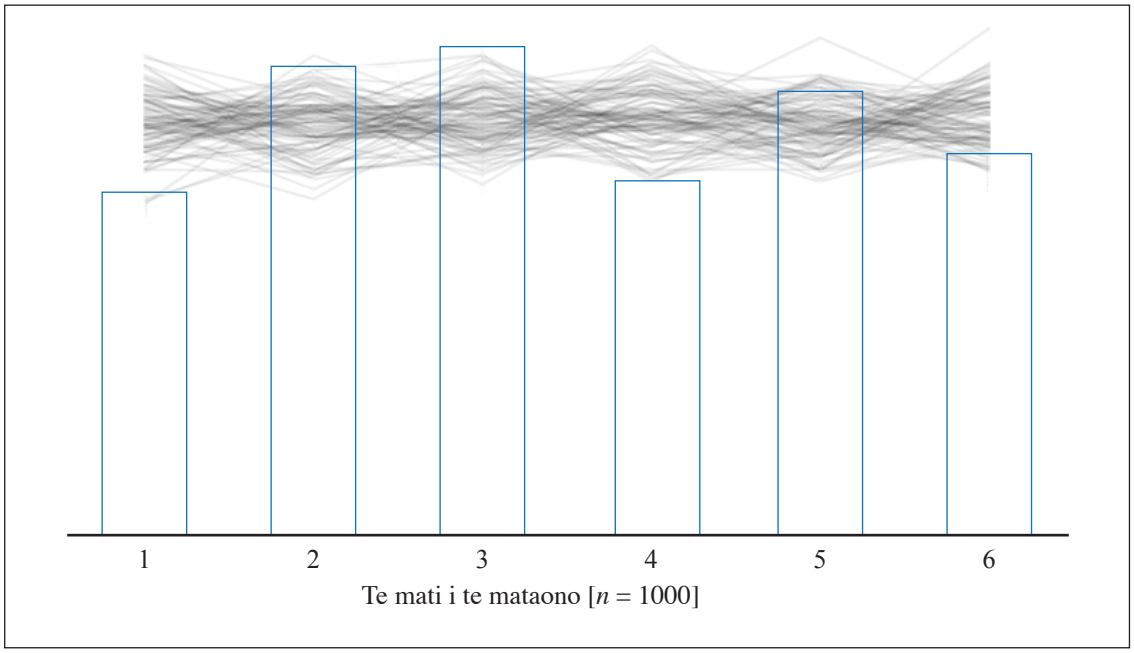
Te putanga	1	2	3	4	5	6
Ngā tapeke	138	189	197	143	179	154

(i) Mō ēnei pīrorihanga 1000, e nui ake ana te tūponotanga o tēhea o ēnei? Ko te pīrori rānei i te 3, i te tapeke rānei e iti iho ana i tērā, ko te pīrori RĀNEI i te 4, i te tapeke nui ake rānei i tērā?

Taunakitia tō tuhinga ki ngā whakaaro ā-tauanga.

E whakaaturia ana i te hoahoa o raro nei ngā hua o ngā whakamātauranga 1000 o tētahi tauira whaihanga. I whakapaetia i roto i te whaihanga e ōrite ana te tūponotanga o ngā putanga katoa o te mataono.

E whakaatu ana te teitei o ngā pou kahurangi poutū i ngā pānga auau o ia putanga mati o te mataono i kitea rā, e whakaaturia ana i te tūtohi o runga ake nei. E whakaatu ana ngā rārangi kiwikiwi i te taurangirangi e whakapaetia ana mō ia putanga, i runga i te whaihanga i ngā pīrorihanga 1000 o tētahi mataono tōkeke.



Ka rere tonu te Tūmahi Tuatoru i te whārangi e whai ake nei.

(ii) Me māharahara rānei te kaitākaro ki te haukume o tētahi o āna mataono?

Whakamahia ngā kitenga o te tauira whaihanga e whakaaturia ana i te hoahoa o te whārangi o mua me ngā putanga o ngā pīrorihanga 1000 e takoto ana i te tūtohi, ā, me kōrero mō te tūponotanga whakamātau, mō te tūponotanga tātai, me te tūponotanga motuhenga hei wāhanga mō tō tuhinga.

(iii) Whakamāramahia te tikanga o tēnei kitenga mō te tūponotanga ko te 2 te tapeke o ngā pīrorihanga, mēnā ka whakamahia tēnei mataono hei mataono kotahi i te pūrua mataono i te kēmu B.

Question Three continues on the next page.

(b) The player is concerned that one of their dice is biased. The outcomes from 1000 rolls of this die are summarised in the table below.

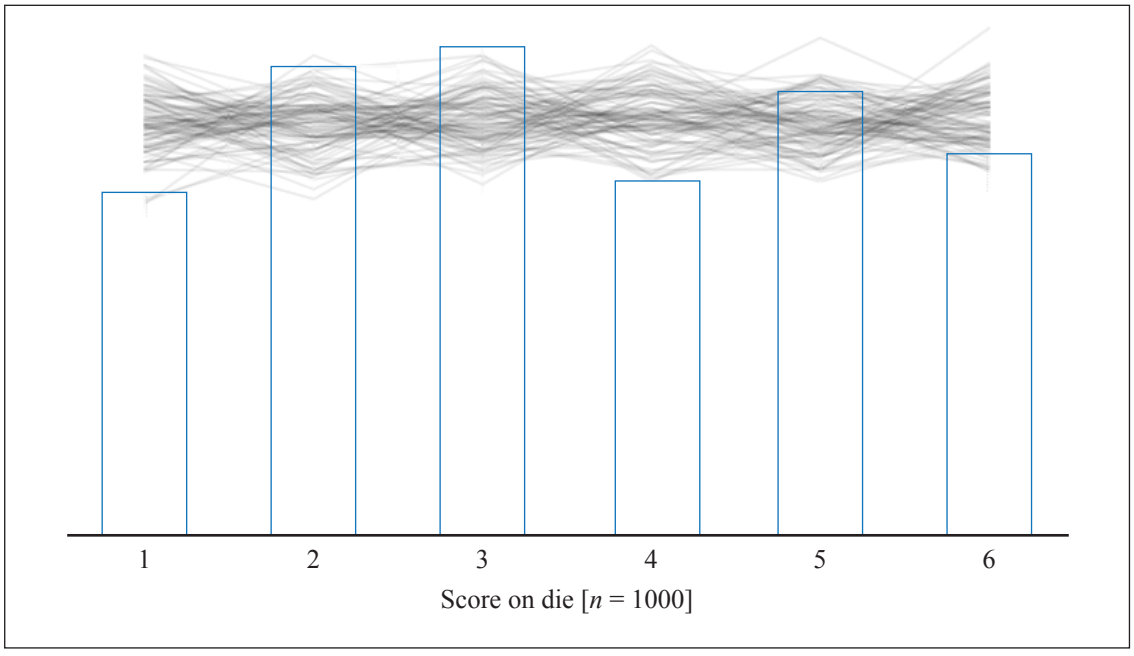
Outcome	1	2	3	4	5	6
Totals	138	189	197	143	179	154

(i) For these 1000 rolls, which is more likely? Rolling 3 or less OR rolling 4 or more?

Support your answer with statistical calculations.

The diagram below shows the results of 1000 trials of a simulation model. The simulation assumed that each outcome on the die was equally likely to occur.

The height of the blue vertical bars shows the relative frequencies of each observed digit outcome on the die, as shown in the table above. The grey band shows the variation expected for each outcome, based on simulating 1000 throws of a fair die.



(ii) Should the player be concerned that one of their dice is biased?

Use the results of the simulation model shown in the diagram on the previous page and the outcomes of the 1000 rolls given in the table, and refer to experimental, theoretical, and true probability as part of your answer.

(iii) Explain what this result means for the chance of throwing a total of 2 using this particular die as one of the pair of dice in game B.

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

English translation of the wording on the front cover

Level 3 Mathematics and Statistics (Statistics) 2024

91585M Apply probability concepts in solving problems

Credits: Four

91585M

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.

Make sure that you have the Formulae and Tables Booklet L3–STATFM.

Show ALL working.

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 2–27 in the correct order and that none of these pages is blank.

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

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