



SECI2143: PROBABILITY & STATISTICAL DATA ANALYSIS 2021/2022 – SEMESTER 2

ASSIGNMENT 2

TOTAL MARKS: 96

INSTRUCTION:

1. This is an assignment for a **GROUP of 3 or 4 (max)**. Please clearly write the group members name & matric number in the front page of the submission.
 2. This assignment has 5 questions (100 marks), which will give 5% of overall course marks.
 3. Only **HANDWRITTEN** submission is accepted:
 - a. Submission using any reporting or statistical tools (e.g.: MS Word, MS Excel, etc,) will be **REJECTED**.
 - b. Make sure the submission is neatly written. Any submission with handwriting that is unreadable, will be **REJECTED**.
 - c. Round your answers to **FOUR** decimal places.
 - d. Please scan/snapshot your work and save as **PDF** file.
 4. Due date: **15th May 2022, 11.59 pm** (via eLearning) – only **ONE** group member needs to submit on behalf of the group.
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QUESTION 1 [20 MARKS]

1. Ali and Alisya are playing with two bags of balls after school. One bag has 3 colored balls (PURPLE, GREEN and YELLOW) in it and the other bag has 4 balls with numbers in it (1, 2, 3 and 4). Amran and Alisya took turns to randomly pick one ball from each bag.
 - a. What are all the possible combinations of the two balls that Ali can take?
[3 marks]
 - b. By removing the balls that Ali has took (*assume that the balls he took is G4*), write all the possible combinations of the two balls that Alisya can take. Show your sample space using a tree diagram.
[2 marks]
 - c. What is the possibility that the colored ball that Alisya take is PURPLE and ball number 2?
[2 marks]

2. You observed that there are 25 computers in the computer lab of your office, where:

- 8 computers run on Windows 10
- 10 computers use Google Chrome as a browser
- 10 computers use neither of the program.

Lets:

$S = \{\text{computers run on Windows 10}\}$

$X = \{\text{computers use Google Chrome}\}$

Consider a random experiment of randomly choosing a computer to be removed from the lab.

- a. What are the probability of choosing:
- i. computers that run on Windows 10 only.
 - ii. computers that use Google Chrome only.
 - iii. computer that uses neither program.

[1.5 marks]

- b. How many computers either ran on Window 10 or used Google Chrome?

[1.5 marks]

- c. How many computers that ran on Windows 10 and used Chrome?

[1.5 marks]

- d. The computer ran on Windows 10 but did not use Google Chrome?

[1.5 marks]

3. A group of tourists consists of 12 males and 18 females. Three of the male tourists and five of the female tourists are from Bahamas. A tourist is randomly selected. Find the

- a. probability of selecting a tourist from Bahamas.

[2 marks]

- b. probability of selecting a male tourist given that the tourist is from Bahamas.

[2 marks]

- c. probability of selecting either a male or a tourist from Bahamas.

[3 marks]

QUESTION 2 [15 MARKS]

1. On average nearly 3 babies were being born in a certain country per day. Let us denote the number of baby girl born per day as X , where $\{X=0, 1, 2, 3\}$

Thus, the probability distribution is:

X	$P(X=x)$
0	$\frac{1}{8}$
1	$\frac{3}{8}$
2	$\frac{3}{8}$
3	$\frac{1}{8}$

Determine each event's probability for the birth when we have:

- a. exactly two girls.
- b. at least two girls.
- c. at most two girls.
- d. all or no girl were born.

[4 marks]

2. Suppose a discrete random variable X has the probability function given by

x	1	3	4	7	9	10	14	18
$P(X=x)$	0.11	0.07	0.13	0.28	0.18	0.05	0.12	0.06

What is the probability that:

- a. X is at least 10?
- b. X is more than 10?
- c. X is less than 4?
- d. X is at least 4 and at most 9?
- e. X is more than 3 and less than 10?
- f. X is between 7 and 9?

[6 marks]

3. From past experience during Hari Raya open-house, Lily observed that the guests usually come with friends or family members. So the probability of the invited guests bring other friends and families are as follows:

# of friends/ family	0*	1	2	3	4	5	6
Probability	0.05	0.1	0.3	0.25	0.15	0.1	0.05

*0 means the guest came alone (did not bring any friends/family members)

Find then probability that the guest brings:

- at least one friend/family member.
- at least three friends/family members.
- at most five friends/family members.
- at least two and not more than four friends/family members.
- an even number of friends/family members.

[5 marks]

QUESTION 3 [25 MARKS]

1. Company AA supplies both metallized capacitors and film foil capacitors. The company claims that it produces not more than 2% defective metallized capacitors. A purchaser picks and tests 50 metallized capacitors at random from an order of 5000 capacitors. He will reject the order if he finds more than one defective

- Let X be the number of defective metallized capacitors.

- What is the probability distribution of X ?

[1 mark]

- If the supplier's claim is true and 2% of the metallized capacitors are defective, what is the probability that the order will be rejected?

[3 marks]

2. 60% of bicycle sold by Xtreme Cycle Shop are folding bike and 40% are mountain bike. The type of bicycle purchased by each of the next 12 customers will be recorded.

Given a random variable x as number of bicycle purchased among these 12 customers, determine:

- The probability that exactly four bicycles are folding bike.

[2 mark]

- The probability that between four and seven (inclusive) are folding bike.

[5 mark]

- Given a random variable x as the number of mountain bike purchased among these 12 customers, determine the probability that exactly two bicycle are mountain bike.

[2 mark]

3. In a Spelling-Bee competition, it is found that 25% of the participants fail to complete the spelling test without a mistake. Of the next 15 participants tested, find the probability that
 - a. from 3 to 6 participants made a spelling mistake [4 marks]
 - b. fewer than 4 participants made a spelling mistake [2 marks]
 - c. more than 5 participants made a spelling mistake [2 marks]

QUESTION 4 [15 MARKS]

1. A construction company conducts a pili driving test that indicates the soil should have a 20% chance of pile penetration.
 - a. What is the probability that the first penetrate comes on the third piled? [2 marks]
 - b. What is the probability that the third penetrate comes on the seventh piled? [3 marks]
 - c. What is the mean and variance of the number of soil location that must be piled if the company wants to set up three pile penetration? [2 marks]

2. Suppose that 40% of the participants attending the Innovation and Technology Seminar will bring their own laptop to showcase their product in the main hall. You are one of the participants, and during the seminar your laptop run out of battery and you did not bring your laptop charger. So you decide to approach other participants and ask them whether they bring a laptop charger.
 - a. Is this a Geometric experiment? Why? [2 marks]
 - b. What does the random variable x present? [1 mark]
 - c. What is the probability that the first participant approached has a laptop charger? [2 marks]
 - d. What is the probability that three or fewer participants must be approached? [3 marks]

QUESTION 5 [25 MARKS]

1. The basketball club in your city are proposing to recruit new members for the elite basketball team of the basketball club. It was set that a requirement that for male players must be at least 178cm tall. In the team, heights of male players are normally distributed with a mean of 163cm and standard deviation of 8cm (based on survey data that has been conducted by the basketball coach).

Suppose you are in the recruiting team and were given task to select candidate and hold a try-out for the team. Based on your record, there are around 5000 candidates that applied to join the team.

- a. Find percentage of candidates who are eligible to be call to the try-out because they fulfil the minimum height requirement of 178cm. [2 marks]
 - b. Among 5000 candidates, how many of them are eligible to be call to the try-out session? [1 mark]
 - c. Due to the very low number of possible candidates for the team, the requirement of heights has been set lower than 178cm. What is the new height requirement if they target that top 17% of candidates can be called for the try-out? [2 marks]
2. Purple and Yellow Steak is a very popular restaurant in the city. The restaurant always has full-house reservation for dinner time. However, since the pandemic, there have been reported that the no-show rate for reservation is 21%. In other words, the probability is 0.21 that a person making a reservation will not turn up to have their dinner in the restaurant.

As the restaurant manager, you observed that for the next Saturday, 180 people have made reservations. Calculate the probability that:

- a. exactly 30 people did not come to the restaurant that night. [2 marks]
- b. between 30 and 35 people, inclusively, do not come to the restaurant. [5 marks]
- c. at least 25 people did not come to the restaurant. [2 marks]
- d. the most 28 people did not come on Saturday. [2 marks]

3. Measurements were taken on the plasma levels of antibodies present in individuals suffering from severe acute respiratory syndrome coronavirus (COVID-19). After a suitable transformation, the corresponding random variable can be modelled by a normal distribution with mean 2.50 and standard deviation 0.83.
- a. Find the Z value of the measured antibodies level that exceeds 5.00 and sketch of the standard normal density for the proportion of individuals with this condition.
[3 marks]
 - b. Find the probability of part (a).
[2 mark]
 - c. For individuals suffering from chronic COVID-19, measurements on the same levels of antibodies are normally distributed with mean 3.00 and standard deviation 1.50. Find the probability of individuals suffering from chronic COVID-19 with an antibodies level below 1.47. How many percent of it?
[4 marks]