UOW
MALAYSIA
KDU PENANG
UNIVERSITY COLLEGE

PART OF THE UNIVERSITY
OF WOLLONGONG AUSTRALIA
GLOBAL NETWORK

School of Engineering, Computing & Built Environment

Department of Computing

Diploma in Computer Studies & Diploma in Information Technology

COMPUTING MATHEMATICS (DCM1124)

September 2020 Semester

[LECTURER'S NAME: Dr. Ang Sau Loong]

[Assignment 2]

[STUDENT NUMBER & STUDENT NAME]

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DUE DATE : [27th November2020]

TOTAL MARKS : [/ 15%]

Plagiarism

The assignment is based on an individual response. The report must be **completely your own work** and you must not copy from others. Any plagiarized work will be zero-rated. Any reference material you use (books, journals, Internet, magazines etc.) must be clearly identified in your report using procedures in the Harvard System of Referencing.

Table of Contents

DCM 1124 Computing Mathematics

Assignment 2 (15%)

Assignment 2: Group work (3-4 students in a group)

Due date for submission	Week 7
Marks	100% (Weighted marks: 15%)

Learning outcomes

CLO4	Use functions and relations with composition, inverse, override and digraphs; and finally solve probability problems using basic counting methods.

Question 1:

Task 1 (Group Work):

An electronic factory decides to purchase electronic components from three suppliers named as Flextronic, Bestronic and Eastronic. The factory receives 50% of the raw material from supplier Flextronic, 15% from Bestronic and 35% from Eastronic. The defective chances for the electronic components received from Flextronic, Bestronic and Eastronic are 3%, 4% and 2% respectively.

a) Draw a tree diagram to represent the scenario mentioned above with appropriate labeling. (20 marks)

b) Find the probability that an electronic components selected from the overall supply to the electronic factory is defective. (10 marks)

c) By selecting two electronic components randomly from the overall supply to the factory, find the probability that:

   (i) At least one electronic component is defective. (10 marks)

   (ii) Both of the electronic components are defective and are supplied by Flextronic. (10 marks)

Task 2 (Individual Work):

In a market survey, 600 respondents are asked whether they prefer perfume brand X, brand Y or brand Z based on their races.

Race	Perfume Brand		
	X	Y	Z
Malay, M	110	90	40
Chinese, C	90	50	50
Indian, I	50	70	50

a) Find the probability that a randomly selected Malay respondent prefers perfume brand Z? (10 marks)

b) Find the probability that a randomly selected respondent prefers perfume brand Z or from the Malay race? (10 marks)

c) Find the probability that a randomly selected respondent is from the Chinese race given that he prefers perfume brand Y? (10 marks)

d) Are the events “Chinese respondent” and “perfume Brand Y” independent? Give your explanation in detail. (10 marks)

e) Are the events “Indian respondent” and “perfume Brand X” mutually exclusive? Give your explanation in detail. (10 marks)

Submission

Use font type of Times New Roman, font size of 12 to present your answers. Kindly submit your assignment according to the sequence of items listed in the table:

Question	Content	Format	Submit to
	Cover Page	PDF	Upload to Canvas
	Question Papers		
1	Answer presented in the following order: 1.Report(Answer with working steps and explanation)		

You are required to present your answers neatly where the indentations and alignment of text must be properly set. Kindly fill up the details of your assignment cover page with the module code, module title, student ID, and submission date. If you have any questions regarding this assignment, kindly discuss with the module tutor for further details.

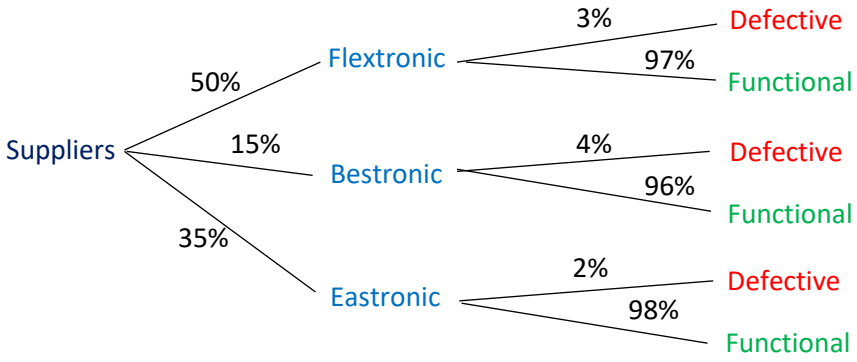
Rules

- **10 marks** will be deducted on daily basis starting after the due date of submission.

Answers

Task 1

a)



b) D: Defective, F: Flextronic, B: Bestronic, E: Eastronic

$$P(\text{Defective}) = P(F \cap D) + P(B \cap D) + P(E \cap D)$$

$$= (0.50 \times 0.03) + (0.15 \times 0.04) + (0.35 \times 0.02)$$

$$= 0.015 + 0.006 + 0.007$$

$$= 0.028$$

$$= \frac{7}{250}$$

c)

i) N: non-defective

P (non-defective)

= 1- P(defective)

= 1 – P(D)

= 1- 0.028

= 0.972

P(at least one is defective)

= 1 – P(both are non-defective)

= 1 – [P(non-defective) x P(non-defective)]

= 1 – [P(N) x P(N)]

= 1 – (0.972 x 0.972)

= 1 – 0.944784

= 0.055

$= \frac{11}{200}$

ii) P(Both defective and from Flextronic)

= P(F ∩ D) x P(F ∩ D)

= (0.50 x 0.03) x (0.50 x 0.03)

= 0.000225

$= \frac{9}{40000}$

Task 2

LIM ZHE YUAN

Race	Perfume Brand		
	X	Y	Z
Malay, M	110	90	40
Chinese, C	90	50	50
Indian, I	50	70	50

Total Malay people: 110+90+40 = 240
Total Chinese people: 90+50+50 = 190
Total Indian people: 50+70+50 = 170

Total people who prefer brand X: 110+90+50 = 250
Total people who prefer brand Y: 90+50+70 = 210
Total people who prefer brand Z: 50+50+40 = 140

a) Find the probability that a randomly selected Malay respondent prefers perfume brand Z?

P(Z | Malay)
= P(Z ∩ Malay) / P(Malay)
= (People who prefer brand Z and are Malay / Total people) / (Total Malay people / Total people)
= (40/600) / (240/600)
= 0.167

b) Find the probability that a randomly selected respondent prefers perfume brand Z or from the Malay race?

P(Z U Malay)
= P(Z) + P(Malay) – P(Z ∩ Malay)
= (People who prefer brand Z / Total people) + (People who are Malay / Total people) – (People who prefer brand Z and are Malay / Total people)
= 140/600 + 240/600 – 40/600
= 0.567

c) Find the probability that a randomly selected respondent is from the Chinese race given that he prefers perfume brand Y?

P(Chinese | Y)
= P(Chinese ∩ Y) / P(Y)
= (People who are Chinese and prefer brand Y / Total people) / (People who prefer brand Y / Total people)
= (50/600) / (210/600)

= 0.238

d) Are the events "Chinese respondent" and "perfume Brand Y" independent? Give your explanation in detail.

Events "Chinese respondent" and "perfume Brand Y" are not independent.

If events "Chinese respondent" and "perfume Brand Y" are independent,
P(Chinese | Y) = P(Chinese ∩ Y) / P(Y)
P(Chinese) = P(Chinese ∩ Y) / P(Y)
P(Chinese) * P(Y) = P(Chinese ∩ Y),
as P(Chinese | Y) = P(Chinese) because the probability of the respondent prefers brand Y, P(Y) does not affect the probability of the respondent being Chinese, P(Chinese) if both events are independent.

Therefore, when values are substituted into the equation,
P(Chinese) * P(Y) = P(Chinese ∩ Y)
(Total people who are Chinese / Total people) * (People who prefer brand Y / Total people) = People who are Chinese and prefer brand Y / Total people
190/600 * 210/600 = 50/600
133/1200 != 100/1200

Both sides of the equation are not the same as 133/1200 is not equal to 100/1200 if it is assumed that P(Y) does not affect P(Chinese). Therefore, both events are not independent. (Rumsey, 2006, 32-34)

e) Are the events “Indian respondent” and “perfume Brand X” mutually exclusive? Give your explanation in detail.

Events “Indian respondent” and “perfume Brand X” are not mutually exclusive.

If events “Indian respondent” and “perfume Brand X” are mutually exclusive,
P(Indian ∩ X) = 0,
as probability of the respondent being Indian and prefers brand X happening at the same time is equals to 0, which means that both events do not share a common value and it is impossible that both events happen at the same time.

Therefore, when values are substituted into the equation,
P(Indian ∩ X) = 0
People who are Indian and prefer brand X / Total people = 0
50/600 != 0
1/12 != 0

1/12 is obviously not equal to 0. Since 1/12 also refers to the probability of the random selected respondent being Indian and prefer Brand X, P(Indian ∩ X), and is a non-zero value, it can be interpreted as a fact that both events do have an intersection and is possible to happen at the same time. Therefore, events “Indian respondent” and “perfume Brand X” are not mutually exclusive. (Rumsey, 2006, 34-35)

Reference:

Rumsey, J.D. (2006) *Probability For Dummies*. New Jersey: John Wiley & Sons.

THOR WEN ZHENG

M: Malay	X: Brand X
C: Chinese	Y: Brand Y
I: Indian	Z: Brand Z

a) $P(Z \mid M) = \frac{P(Z \cap M)}{P(M)}$

$= \frac{\frac{40}{600}}{\frac{240}{600}}$

$= \frac{40}{240}$

$= \frac{1}{6}$

≈ 0.167

b) $P(Z \cup M) = P(Z) + P(M) - P(Z \cap M)$

$= \frac{140}{600} + \frac{240}{600} - \frac{40}{600}$

$= \frac{17}{30}$

≈ 0.567

c) $P(C \mid Y) = \frac{P(C \cap Y)}{P(Y)}$

$= \frac{\frac{50}{600}}{\frac{210}{600}}$

$= \frac{50}{210}$

$= \frac{5}{21}$

≈ 0.238

d)

The events "Chinese respondent" and "prefer Brand Y" are not independent. Two events are considered to be independent if the occurrence of one of the 2 events does not affect the probability of the other event occurring (Mukhopadhyay, 2020, 10). Using this logic, it is clear that the events "Chinese respondent" and "prefer Brand Y" are not independent based on the situation. This is because the occurrence of the event "Chinese respondent" will affect the probability of "prefer Brand Y", and vice versa. To prove that the events "Chinese respondent" and "prefer Brand Y" are not independent, it is demonstrated with examples below.

For example, it is known that the probability of the event "Chinese respondent" alone is $\frac{19}{60}$. However, what if the event "prefer Brand Y" is given? If these 2 events are independent, then the probability of the event "Chinese respondent" will not change even if the event "prefer Brand Y" is given and vice versa, and the mathematical formula **P(C | Y) = P(C) or P(Y | C) = P(Y)**, will be true (Mukhopadhyay, 2020, 10). However, this formula is false in this situation.

Also, if the event "prefer Brand Y" is given, the probability of the event "Chinese respondent" will change, and vice versa. Using mathematical formulas:

$$P(C \mid Y) = \frac{P(C \cap Y)}{P(Y)} \qquad P(Y \mid C) = \frac{P(Y \cap C)}{P(C)}$$ (Mukhopadhyay, 2020, 9)

$$= \frac{\frac{50}{600}}{\frac{210}{600}} \qquad = \frac{\frac{50}{600}}{\frac{190}{600}}$$

$$= \frac{50}{210} \qquad = \frac{50}{190}$$

$$= \frac{5}{21} \qquad = \frac{5}{19}$$

$$\approx 0.238 \qquad \approx 0.263$$

$$P(C) = \frac{19}{60} \qquad P(Y) = \frac{7}{20}$$

$$\approx 0.317 \qquad \approx 0.35$$

With these calculations, it is known that $P(C \mid Y) \neq P(C)$ and $P(Y \mid C) \neq P(Y)$, which proves that the occurrence of one of the events "Chinese respondent" or "prefer Brand Y" will affect the probability of the other event. Therefore, it makes sense to conclude that the events "Chinese respondent" and "prefer Brand Y" are not independent.

e)

The events "Indian respondent" and "prefer Brand X" are not mutually exclusive. Two events are considered to be mutually exclusive only if they both cannot occur at the same time (Holmes et al., 2017, 140). Based on this logic, the events "Indian respondent" and "prefer Brand X" are not mutually exclusive. This is because based on the situation in the question, the events "Indian respondent" and "prefer Brand X" can occur at the same time.

For 2 events to be mutually exclusive, they need to be disjoint, meaning that they should have no intersection. Mathematically, these equations would have to be true:

- $P(I \cap X) = 0$ (Holmes et al., 2017, 140)
- $P(I \cup X) = P(I) + P(X)$ (Holmes et al., 2017, 147)

However, in this situation, those equations are not true because based on the question, these calculations can be made:

$$P(I \cap X) = \frac{50}{600}$$

$$\approx 0.083$$

$$P(I \cup X) = P(I) + P(X) - P(I \cap X) \quad \text{(Holmes et al., 2017, 147)}$$

$$= \frac{170}{600} + \frac{250}{600} - \frac{50}{600}$$

$$= \frac{37}{60}$$

$$\approx 0.617$$

With these calculations, it is known that $P(I \cap X) \neq 0$ and $P(I \cup X) \neq P(I) + P(X)$. From these results, it is also proven that the events "Indian respondent" and "prefer Brand X" have intersection and are not disjoint because P(I and X) = 0.083 or $P(I \cap X) \neq 0$. The intersecting probability must also be subtracted. Because these 2 events are not disjoint and have intersection, this means that they can both occur at the same time. So, it is logical to conclude that they are not mutually exclusive.

Reference List

Holmes, A., Illowsky, B. and Dean, S. (2017) *Introductory Business Statistics*. Samurai Media Limited.

Mukhopadhyay, N. (2020) *Probability and Statistical Inference*. CRC Press.

Lim Hui Peng

Race	Perfume Brand			Total
	X	Y	Z	
Malay	110	90	40	**240**
Chinese	90	50	50	**190**
Indian	50	70	50	**170**
Total	**250**	**210**	**140**	**600**

Reference

Malay respondent = M
Chinese respondent = C
Indian respondent = I

Perfume brand X = X
Perfume brand Y = Y
Perfume brand Z = Z

(a) Find the probability that a randomly selected Malay respondent prefers perfume brand Z?

$P(Z \mid M) = P(Z \cap M) / P(M)$
$= (40/600) / (240/600)$
$= 40/240$
$= 1/6$
$= 0.1667$

(b) Find the probability that a randomly selected respondent prefers perfume brand Z or from the Malay race?

$P(Z \cup M) = P(Z) + P(M) - P(Z \cap M)$
$= (140/600) + (240/600) - (40/600)$
$= 340/600$
$= 17/30$
$= 0.5667$

(c) Find the probability that a randomly selected respondent is from the Chinese race given that he prefers perfume brand Y?

$P(C \mid Y) = P(C \cap Y) / P(Y)$
$= (50/600) / (210/600)$
$= 50/210$
$= 5/21$
$= 0.238$

(d) Are the events "Chinese respondent" and "perfume Brand Y" independent? Give your explanation in detail.

The events "Chinese respondent" and "Perfume Brand Y" are not independent. The explanation is shown below:

$P(C \mid Y) = P(C \cap Y) / P(Y)$ $\quad P(Y) = 210/600$
$= (50/600) / (210/600)$ $\quad = 7/20$
$= 50/210$
$= 5/21$

$P(Y \mid C) = P(Y \cap C) / P(C)$ $\quad P(C) = 190/600$
$= (50/600) / (190/600)$ $\quad = 19/60$
$= 50/190$
$= 5/19$

It can also write in:

$P(Y \cap C) = 50/600$
$P(Y)\,P(C) = (210/600)*(190/600)$
$= 133/1200 \neq 50/600$

Hence, $P(C)\,P(Y) \neq P(C \cap Y)$ and $P(Y)\,P(C) \neq P(Y \cap C)$. The occurrence of "Chinese respondent" and "Perfume Brand Y" will affect the probability of each other, so the events are not independent.

(e) Are the events "Indian respondent" and "perfume Brand X" mutually exclusive? Give your explanation in detail.

The events "Indian respondent" and "Perfume Brand X" are not mutually exclusive. Mutually exclusive are the events that can't occur at the same time, so it is equal to 0. The explanation is shown below:

$P(I \cap X) = 50/600$
$50/600 \neq 0$

For the reason that, $P(I \cap X) \neq 0$. It because 50/600 is not equal to 0 so the events "Indian respondent" and "Perfume Brand X" are not mutually exclusive.

Khoo Soon Fatt

Race	Perfume Brand			Total
	X	Y	Z	
Malay	110	90	40	**240**
Chinese	90	50	50	**190**
Indian	50	70	50	**170**
Total	**250**	**210**	**140**	**600**

Reference

Malay respondent = M Perfume brand X = X
Chinese respondent = C Perfume brand Y = Y
Indian respondent = I Perfume brand Z = Z

(a) Find the probability that a randomly selected Malay respondent prefers perfume brand Z?

$P(Z \mid M) = P(Z \cap M)$
$= (40/600)$
$= 0.6667 \times 100\%$
$= 6.667\%$

(b) Find the probability that a randomly selected respondent prefers perfume brand Z or from the Malay race?

$P(Z \cup M) = P(Z) + P(M) - P(Z \cap M)$
$= (140/600) + (240/600) - (40/600)$
$= 340/600$
$= 17/30$
$= 0.5667$

(c) Find the probability that a randomly selected respondent is from the Chinese race given that he prefers perfume brand Y?

$P(C \mid Y) = P(C \cap Y)$
$= (50/190)$
$= 0.26$
$= 26.316\%$

(d) Are the events “Chinese respondent” and “perfume Brand Y” independent? Give your explanation in detail.

The events “Chinese respondent” and “Perfume Brand Y” are not independent. The explanation is shown below:

$P(Y \mid C) = (210/600)$ and $P(C) = (190/600) – (50/600)$
$= 7/20$ $= (140/600)$
$= 7/30$

Therefore, The “Chinese respondent” and “Perfume Brand Y” will affect the probability of each other, so the events are not independent.

(e) Are the events “Indian respondent” and “perfume Brand X” mutually exclusive? Give your explanation in detail.

The events “Indian respondent” and “Perfume Brand X” are not mutually exclusive.

Mutually exclusive are the events that can’t occur at the same time, therefore :

$P(I \cap X) = 50/600$
$50/600 \neq 1/600$

Conclusion, it cannot be mutual exclusive.

Heng Shao Ying

Race	Perfume Brand		
	X	Y	Z
Malay, M	110	90	40
Chinese, C	90	50	50
Indian, I	50	70	50

Total Malay respondents = 110 + 90 + 40 = 240
Total Chinese respondents = 90 + 50 + 50 = 190
Total Indian respondents = 50 + 70 + 50 = 170
Total respondents = 240 + 190 + 170 = 600

Total Perfume Brand X = 110 + 90 + 50 = 250
Total Perfume Brand Y = 90 + 50 + 70 = 210
Total Perfume Brand Z = 40 + 50 + 50 = 140
Total Perfume Brands = 250 + 210 + 140 = 600

A) Find the probability that a randomly selected Malay respondent prefers perfume brand Z.

$P(Z \mid M) = P(Z \cap M) / P(M)$
$= (40/600) / (240/600)$
$= 40/240$
$= 0.1667$
$= 16.67\%$

B) Find the probability that a randomly selected respondent prefers perfume brand Z or from the Malay race.

$P(Z \cup M) = P(Z) + P(M) – P(Z \cap M)$
$= (140/600) + (240/600) – (40/600)$
$= 340/600$
$= 0.5667$
$= 5.667\%$

C) Find the probability that a randomly selected respondent is from the Chinese race given that he prefers perfume brand Y

$P(C \mid Y) = P(C \cap Y) / P(Y)$
$= (50/600) / (210/600)$
$= 50/210$
$= 0.238$
$= 2.38\%$

D) Are the events “Chinese respondent” and “Perfume Brand Y” independent? Give your explanation in detail.

The events “Chinese respondent” and “Perfume Brand Y” **IS** independent

E) Are the events “Indian respondent” and “Perfume Brand X” mutually exclusive? Give your explanation in detail.

The events “Indian respondent” and “Perfume Brand X” **IS NOT**

mutually exclusive.