UTM UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

Assignment 2 (Group)
SECI2143-07
Probability & Statistical Data Analysis

SEMESTER II, SESSION 2021/2022

Lecturer: Dr. Nor Azizah Ali

Group Name: Little Group

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Subject: Probability & Statistical Data Analysis

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Date: 15/5/2022

Assignment 2 (Question 1)

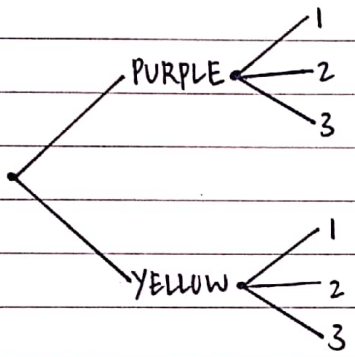
1. $B1 = \{PURPLE, GREEN, YELLOW\}$

$B2 = \{1, 2, 3, 4\}$

a) $S = \{(PURPLE, 1), (PURPLE, 2), (PURPLE, 3), (PURPLE, 4),$
$(GREEN, 1), (GREEN, 2), (GREEN, 3), (GREEN, 4),$
$(YELLOW, 1), (YELLOW, 2), (YELLOW, 3), (YELLOW, 4)\}$

b) $B1 = \{PURPLE, YELLOW\}$

$B2 = \{1, 2, 3\}$



$S = \{(PURPLE, 1), (PURPLE, 2), (PURPLE, 3),$
$(YELLOW, 1), (YELLOW, 2), (YELLOW, 3)\}$

c) $P(PURPLE) = \frac{1}{3}$

$P(2) = \frac{1}{4}$

$P(PURPLE \cap 2) = \frac{1}{3} \times \frac{1}{4}$

$= \frac{1}{12}$

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

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

a)

i) $P(S) = \frac{8}{25}$

$= 0.3200$

ii) $P(X) = \frac{10}{25}$

$= \frac{2}{5} = 0.4000$

iii) $P(S' \cap X') = \frac{10}{25}$

$= \frac{2}{5} = 0.4000$

b) $P(S' \cap X') = P(S \cup X)'$

$P(S \cup X) = 1 - P(S \cup X)'$

$= 1 - \frac{10}{25}$

$= \frac{3}{5}$

$= 0.6000$

c) $P(S \cup X) = P(S) + P(X) - P(S \cap X)$

$P(S \cap X) = P(S) + P(X) - P(S \cup X)$

$= \frac{8}{25} + \frac{10}{25} - \frac{3}{5}$

$= \frac{3}{25}$

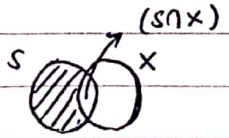
$= 0.1200$

d) $P(S \cap X') = P(S) - P(S \cap X)$

$= \frac{8}{25} - \frac{3}{25}$

$= \frac{5}{25}$

$= \frac{1}{5} = 0.2000$



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3. $M = 12$

$F = 18$

$S = 30$

$M \cap B = 3$

$F \cap B = 5$

$B = 8$

a) $P(\text{Bahamas}) = \frac{8}{30}$

$= \frac{4}{15}$

$= 0.2667$

b) $P(M|B) = \frac{P(M \cap B)}{P(B)}$

$= \frac{3}{8}$

$= 0.3750$

c) $P(M \cup B) = P(M) + P(B) - P(M \cap B)$

$= \frac{12}{30} + \frac{8}{30} - \frac{3}{30}$

$= \frac{17}{30}$

$= 0.5667$

Q2:

1.

a: $p(x=2) = \frac{3}{8}$

b: $p(x\geq 2) = p(2) + p(3) = \frac{3}{8} + \frac{1}{8} = \frac{1}{2}$

c: $p(x\leq 2) = p(0) + p(1) + p(2) = \frac{1}{8} + \frac{3}{8} + \frac{3}{8} = \frac{7}{8}$

d: $p(x=0) = \frac{1}{8}$

$p(x=3) = \frac{1}{8}$

$p = \frac{1}{8} + \frac{1}{8} = \frac{1}{4}$

2.

a. $p(x\geq 16) = p(x=16) + p(x=14) + p(x=18)$

$= 0.05 + 0.12 + 0.06 = 0.23$

b: $p(x>16) = p(x=14) + p(x=18) = 0.12 + 0.06 = 0.18$

c: $p(x<14) = p(x=12) + p(x=13) = 0.11 + 0.07 = 0.17$

d: $p(14\leq x\leq 18) = p(x=14) + p(x=17) + p(x=18)$

$= 0.13 + 0.28 + 0.18 = 0.59$

e: $p(13<x<18) = p(x=14) + p(x=17) + p(x=18)$

$= 0.13 + 0.28 + 0.18 = 0.59$

f: $p(17\leq x\leq 18) = p(x=17) + p(x=18) = 0.28 + 0.18 = 0.46$

3:

a: $p(x\leq 1) = p(x=0) + p(x=1) = 0.05 + 0.1 = 0.15$

b: $p(x\leq 3) = p(x=0) + p(x=1) + p(x=2) + p(x=3) = 0.05 + 0.1 + 0.3 + 0.25 = 0.7$

c: $p(x\leq 5) = 1 - p(x=6) = 1 - 0.05 = 0.95$

~~$p(3\leq x\leq 4)$~~ $p(x$

d: $p(2\leq x\leq 4) = p(x=2) + p(x=4) + p(x=3) = 0.3 + 0.15 + 0.25 = 0.7$

e: $p = p(x=0) + p(x=2) + p(x=4) + p(x=6)$

$= 0.05 + 0.3 + 0.15 + 0.05$

$= 0.55$

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Question 3

1. pick 50 out of 5000, if ≥ 1 defect then reject.

a) i) Binomial distribution

ii) $P(X>1) = 1 - P(X=0) - P(X=1)$

$= 1 - b(0;50,0.02) - b(1;50,0.02)$

$= 1 - \binom{50}{0}(0.02)^0(0.98)^{50} - \binom{50}{1}(0.02)^1(0.98)^{49}$

$= 1 - 0.3642 - 0.3716$

$= 0.2642$

2. 60% folding bike, 40% mountain bike

a) $P(X=4) = b(4;12,0.6)$

$= \binom{12}{4}(0.6)^4(0.4)^8$

$= 0.0420$

b) $P(4 \leq X \leq 7) = P(X=4) + P(X=5) + P(X=6) + P(X=7)$

$= b(4;12,0.6) + b(5;12,0.6) + b(6;12,0.6) + b(7;12,0.6)$

$= \binom{12}{4}(0.6)^4(0.4)^8 + \binom{12}{5}(0.6)^5(0.4)^7 + \binom{12}{6}(0.6)^6(0.4)^6$

$= 0.04207 + 0.1009 + 0.1766 + 0.2270$

$= 0.5465$

c) $P(X=2) = b(2;12,0.4)$

$= \binom{12}{2}(0.4)^2(0.6)^{10}$

$= 0.0639$

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3 a) $P(3 \le X \le 6) = P(X=3) + P(X=4) + P(X=5) + P(X=6)$

$= b(3;15,0.25) + b(4;15,0.25) + b(5;15,0.25) + b(6;15,0.25)$

$= \binom{15}{3}(0.25)^3(0.75)^{12} + \binom{15}{4}(0.25)^4(0.75)^{11} + \binom{15}{5}(0.25)^5(0.75)^{10} + \binom{15}{6}(0.25)^6(0.75)^9$

$= 0.2252 + 0.2252 + 0.1651 + 0.0917$

$= 0.7072$

b) $P(X<4) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$

$= b(0;15,0.25) + b(1;15,0.25) + b(2;15,0.25) + b(3;15,0.25)$

$= \binom{15}{0}(0.25)^0(0.75)^{15} + \binom{15}{1}(0.25)^1(0.75)^{14} + \binom{15}{2}(0.25)^2(0.75)^{13} + \binom{15}{3}(0.25)^3(0.75)^{12}$

$= 0.0134 + 0.0668 + 0.1559 + 0.2252$

$= 0.4613$

c) $P(X>5) = 1 - P(X \le 5)$

$= 1 - P(X<4) - P(X=4) - P(X=5)$

$= 1 - 0.4613 - \binom{15}{4}(0.25)^4(0.75)^{11} - \binom{15}{5}(0.25)^5(0.75)^{10}$

$= 1 - 0.4613 - 0.2252 - 0.1651$

$= 0.1484$

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Question 4

1 a) 20% pile penetration

$P(X=3) = (1-0.2)^{3-1}(0.2)$

$= (0.8)^2(0.2)$

$= 0.1280$

b) $b^*(7;3,0.2) = \binom{7-1}{3-1}(0.2)^3(0.8)^4$

$= \binom{6}{2}(0.2)^3(0.8)^4$

$= 0.0492$

c) $n=3$, $p=0.2$, $q=0.8$

$\text{mean} = \frac{n}{p}$ $\qquad$ $\text{variance} = n\frac{1-p}{p^2}$

$= \frac{3}{0.2}$ $\qquad$ $= 3\frac{(1-0.2)}{0.2^2}$

$= 15$ $\qquad$ $= 60$

2 a) Yes. We must counts the number of trials until obtain first success.

b) Random variable x represent who bring a laptop charger.

c) $P(X=1) = (1-0.4)^{1-1}(0.4)$

$= 0.4$

d) $P(X \leq 3) = P(X=1) + P(X=2) + P(X=3)$

$= (0.6)^0(0.4) + (0.6)^1(0.4) + (0.6)^2(0.4)$

$= 0.4000 + 0.2400 + 0.1440$

$= 0.7840$

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Question 5

1. $\mu = 163$

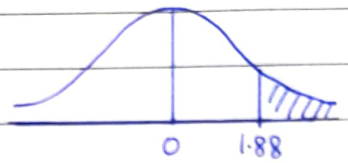
$\sigma = 8$

(a) $P(X \geq 178)$

$Z = \frac{x - \mu}{\sigma}$

$= \frac{178 - 163}{8}$

$= 1.88$



$P(Z = 1.88) = 1 - 0.96995$

$= 0.03005$

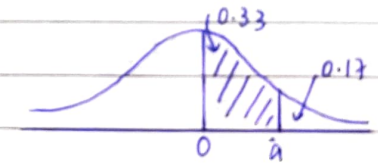
$0.03005 \times 100\% = 3\%$ *

(b) $5000 \times 0.03 = 150$ #

(c) $0.5 - 0.17 = 0.33$

$P(Z = 0.96) = 0.33$

$z = 0.96$



$X = \mu + Z \cdot \sigma$

$= 163 + (0.96)(8)$

$= 170.68$

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2. $p = 0.21$

$n = 180$

$\mu = np$
$= (180)(0.21)$
$= 37.8$

$\sigma^2 = npq$
$= (180)(0.21)(0.79)$
$= 29.862$

$\sigma = \sqrt{29.862}$
$= 5.465$

(a) $P(X = 30) = b(30; 180, 0.21)$
$= {}^{180}C_{30}\,(0.21)^{30}(0.79)^{150}$
$= 0.0271$

(b) $P(30 \leq X \leq 35)$

$$Z = \frac{X - \mu}{\sigma}$$

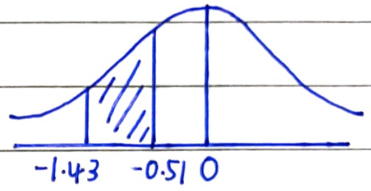
$$= \frac{30 - 37.8}{5.465}$$

$$= -1.43$$

$$Z = \frac{X - \mu}{\sigma}$$

$$= \frac{35 - 37.8}{5.465}$$

$$= -0.51$$



$P(Z = -1.43) = 0.07636$

$P(Z = -0.51) = 0.30503$

$P(30 \leq X \leq 35) = 0.30503 - 0.07636$

$= 0.2287$

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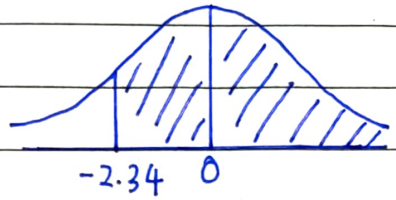
(c) $P(X \geq 25)$

$$Z = \frac{X - \mu}{\sigma}$$

$$= \frac{25 - 37.8}{5.465}$$

$$= -2.34$$



$P(Z = -2.34) = 1 - 0.00964$

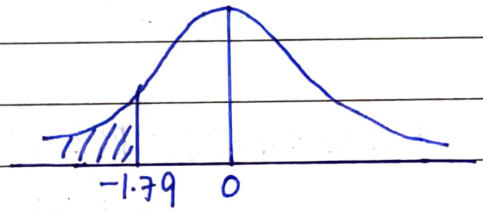
$= 0.9904$

(d) $P(X \leq 28)$

$$Z = \frac{X - \mu}{\sigma}$$

$$= \frac{28 - 37.8}{5.465}$$

$$= -1.79$$



$P(Z = -1.79) = 0.03673$

3. $\mu = 2.50$

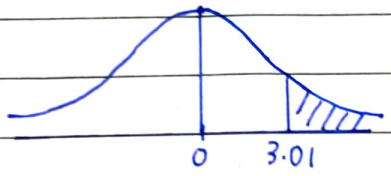
$\sigma = 0.83$

(a) $P(X > 5.00)$

$$Z = \frac{X - \mu}{\sigma}$$

$$= \frac{5.00 - 2.50}{0.83}$$

$$= 3.01$$



(b) $P(Z = 3.01) = 1 - 0.99869$

$$= 0.0013 \#$$

(c) $\mu = 3.00$

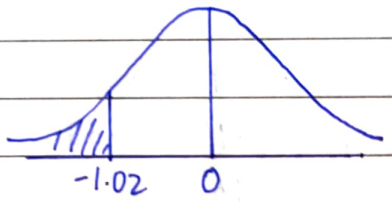
$\sigma = 1.50$

$P(X < 1.47)$

$$Z = \frac{X - \mu}{\sigma}$$

$$= \frac{1.47 - 3.00}{1.50}$$

$$= -1.02$$



$P(Z = -1.02) = 0.15386$

$0.15386 \approx 0.1539$

$0.1539 \times 100\% = 15.39\% \#$