



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

**PROBABILITY & STATISTICAL DATA ANALYSIS
SECTION-02**

SECI2143 20202021/2

GROUP/ASSIGNMENT:
GROUP 4(HIV)/ASSIGNMENT 2

LECTURER'S NAME:
DR CHAN WENG HOWE

GROUP MEMBERS:

NAME	MATIRC NO.
HONG PEI GEOK	A20EC0044
LOW JUNYI	A20EC0071
TAN YONG SHENG	A20EC0157
VINCENT BOO EE KHAI	A20EC0231

QUESTION 1

$$\begin{aligned} \text{a) } P(C \cup B \cup A) &= 0.34 + 0.29 + 0.08 \\ &= 0.71 \end{aligned}$$

$$\begin{aligned} \text{b) } P(C \cup D \cup E) &= 0.34 + 0.17 + 0.12 \\ &= 0.63 \end{aligned}$$

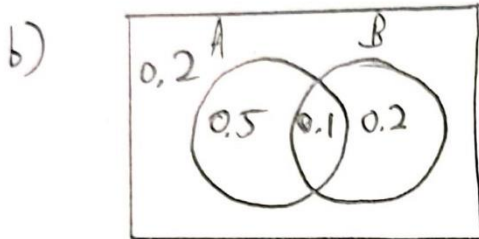
$$\begin{aligned} \text{c) } P(\neq E \cup \neq A) &= P(B) + P(C) + P(D) \\ &= 0.29 + 0.34 + 0.17 \\ &= 0.80 \end{aligned}$$

$$\begin{aligned} \text{d) } P(D \cup A) &= 0.17 + 0.08 \\ &= 0.25 \end{aligned}$$

Question 2

a) $P(A) = 0.60$
 $P(B) = 0.30$
 $P(A \cup B) = 0.80$

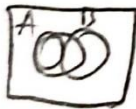
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$0.80 = 0.60 + 0.30 - P(A \cap B)$$
$$0.80 = 0.90 - P(A \cap B)$$
$$P(A \cap B) = 0.10 \quad \#$$



c) $P(A' \cap B) = P(B) - P(A \cap B)$

$$= 0.3 - 0.1$$
$$= 0.2$$

d) $P(A' \cap B') = 1.0 - 0.8$
 $= 0.2$

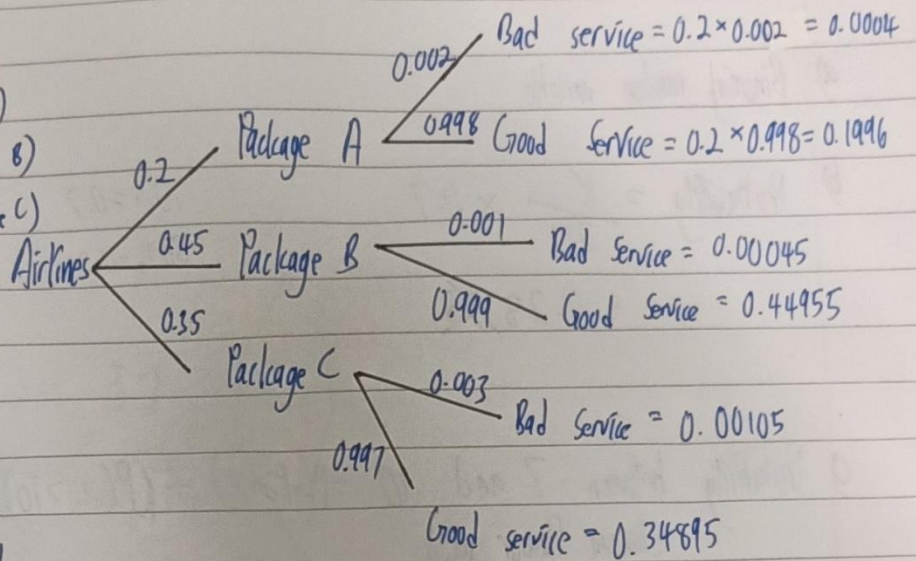


e) $P(A' \cup B') = 1 - P(A \cap B)$
 $= 1 - 0.1$
 $= 0.9$

f) $P(A \cap B') = P(A) - P(A \cap B)$
 $= 0.6 - 0.1$
 $= 0.5$

Question 3

- a) $20\% = 0.2 = P(\text{Package A})$
 $45\% = 0.45 = P(\text{Package B})$
 $35\% = 0.35 = P(\text{Package C})$



$$\text{Good Service A} = 1 - 0.002$$

$$= 0.998$$

$$\text{Good Service B} = 1 - 0.001$$

$$= 0.999$$

$$\text{Good Service C} = 1 - 0.003$$

$$= 0.997$$

$$b) P(\text{Good}) = P(A, \text{good}) + P(B, \text{good}) + P(C, \text{good})$$

$$= 0.1996 + 0.44955 + 0.34895$$

$$= 0.9981$$

$$c) P(B|\text{Good}) = \frac{P(B \cap \text{Good})}{P(\text{Good})} = \frac{0.45 \times 0.999}{0.9981} = 0.4504$$

Question 4

a) Binomial distribution

b) $n=20$, $p=0.70$, $q=0.30$

$$\begin{aligned} P(X=8) &= b(8; 20, \frac{7}{10}) \\ &= \binom{20}{8} \left(\frac{7}{10}\right)^8 \left(\frac{3}{10}\right)^{12} \\ &= 0.003859 \approx 0.0039 \end{aligned}$$

$$\begin{aligned} c) P(7 \leq X \leq 10) &= P(X=7) + P(X=8) + P(X=9) + P(X=10) \\ &= b(7; 20, \frac{7}{10}) + b(8; 20, \frac{7}{10}) + b(9; 20, \frac{7}{10}) + b(10; 20, \frac{7}{10}) \\ n=20 \quad &= \binom{20}{7} \left(\frac{7}{10}\right)^7 \left(\frac{3}{10}\right)^{13} + \binom{20}{8} \left(\frac{7}{10}\right)^8 \left(\frac{3}{10}\right)^{12} + \binom{20}{9} \left(\frac{7}{10}\right)^9 \left(\frac{3}{10}\right)^{11} + \binom{20}{10} \left(\frac{7}{10}\right)^{10} \left(\frac{3}{10}\right)^{10} \\ p=0.70 \quad &= 0.001018 + 0.003859 + 0.012007 + 0.030817 \\ q=0.30 \quad &= 0.047701 \approx 0.0477 \end{aligned}$$

$$\begin{aligned} d) P(3 \leq X \leq 5) &= P(X=3) + P(X=4) + P(X=5) \\ &= \binom{20}{3} \left(\frac{3}{10}\right)^3 \left(\frac{7}{10}\right)^{17} + \binom{20}{4} \left(\frac{3}{10}\right)^4 \left(\frac{7}{10}\right)^{16} + \binom{20}{5} \left(\frac{3}{10}\right)^5 \left(\frac{7}{10}\right)^{15} \\ n=20 \quad &= 0.071604 + 0.130421 + 0.178863 \\ p=0.3 \quad &= 0.380888 \approx 0.3809 \\ q=0.7 \end{aligned}$$

Question 5

$$\textcircled{a) i) } g(3, 0.7) = (1-0.7)^{3-1}(0.7) \\ = 0.063$$

$$\textcircled{ii) } g(1, 0.7) = (1-0.7)^{1-1}(0.7) \\ = 0.7$$

$$g(2, 0.7) = (1-0.7)^{2-1}(0.7) \\ = 0.21$$

$$\text{Total} = g(1, 0.7) + g(2, 0.7) + g(3, 0.7) \\ = 0.7 + 0.21 + 0.063 \\ = 0.973$$

$$\textcircled{iii) } g(5, 0.7) + g(6, 0.7) + g(7, 0.7) \\ = (1-0.7)^{5-1}(0.7) + (1-0.7)^{6-1}(0.7) + (1-0.7)^{7-1}(0.7) \\ = 0.00567 + 0.0017 + 0.00051 \\ = 0.00788$$

$$\textcircled{b) } \mu = \frac{1}{p} \\ = \frac{1}{0.7} \\ = 1.43$$

$$\sigma^2 = \frac{1-0.7}{(0.7)^2} \\ = 0.6122$$

Question (6)

$$a) P(X < 35.8 \text{ or } X > 36.2)$$

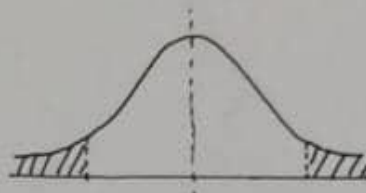
$$= 1 - P(35.8 < X < 36.2)$$

$$= 1 - P\left(\frac{35.8-36}{0.1} < Z < \frac{36.2-36}{0.1}\right)$$

$$= 1 - [P(Z < 2) - P(Z < -2)]$$

$$= 1 - (0.9772 - 0.0228)$$

$$= 0.0456$$



$$b) p = 0.0456, q = 0.9544$$

$$P(X=0) = b(0, 16, 0.0456)$$

$$= \binom{16}{0} \times (0.0456)^0 \times (0.9544)^{16}$$

$$= 0.4739$$

$$c) P(X=1) = b(1, 16, 0.0456)$$

$$= \binom{16}{1} \times (0.0456)^1 \times (0.9544)^{15}$$

$$= 0.36227$$

$$\approx 0.3623$$

$$d) \mu = 37, \sigma = 0.4$$

$$P(X < 35.8 \text{ or } X > 36.2)$$

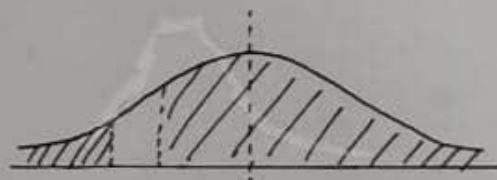
$$= 1 - P(35.8 < X < 36.2)$$

$$= 1 - P\left(\frac{35.8-37}{0.4} < Z < \frac{36.2-37}{0.4}\right)$$

$$= 1 - [P(Z < -2) - P(Z < -3)]$$

$$= 1 - (0.0228 - 0.0013)$$

$$= 0.9785$$



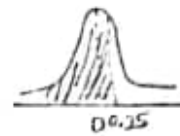
QUESTION 7

$$\mu = 28 \quad \sigma = 8$$

$$\begin{aligned} \text{a) } P(20 < X < 40) &= P\left(\frac{20-28}{8} < Z < \frac{40-28}{8}\right) \\ &= P(-1 < Z < 1.5) \\ &= 0.93319 - 0.15866 \\ &= 0.77453 \end{aligned}$$



$$\begin{aligned} \text{b) } P(X < 30) &= P\left(Z < \frac{30-28}{8}\right) \\ &= P(Z < 0.25) \\ &= 0.59871 \end{aligned}$$



c) Let t = number of days

$$P(X > t) = 0.75$$

$$P(X \leq t) = 1 - 0.75$$

$$= 0.25$$

$$P\left(Z \leq \frac{t-28}{8}\right) = 0.25$$

$$Z = -0.67$$

$$\frac{t-28}{8} = -0.67$$

$$t = 22.64$$

$$t \approx 23$$

