



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

SESSION 2020/2021 SEMESTER 2

SECI2143 – PROBABILITY & STATISTICAL DATA ANALYSIS

Dr. Nor Azizah Ali

Assignment 2

SECTION: 05

Group Name: Data Miners

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Assignment 2

No:

Date:

Question 1

$$\begin{aligned} \text{a) } P(\text{Average, easy or very easy}) &= P(C) + P(B) + P(A) \\ &= 0.34 + 0.29 + 0.08 \\ &= 0.71 \end{aligned}$$

$$\begin{aligned} \text{b) } P(\text{Average, difficult or very difficult}) &= P(C) + P(D) + P(E) \\ &= 0.34 + 0.17 + 0.12 \\ &= 0.63 \end{aligned}$$

~~$$\begin{aligned} \text{c) } P(\overline{E \text{ or } A}) &= 1 - P(E \text{ or } A) \\ &= 1 - 0.2 \\ &= 0.8 \end{aligned}$$~~

~~$$\begin{aligned} P(\overline{A}) &= 1 - P(A) \\ &= 1 - 0.08 \\ &= 0.92 \end{aligned}$$~~

$$\begin{aligned} \text{e) } P(E \text{ or } A) &= P(E) + P(A) \\ &= 0.12 + 0.08 \\ &= 0.2 \end{aligned}$$

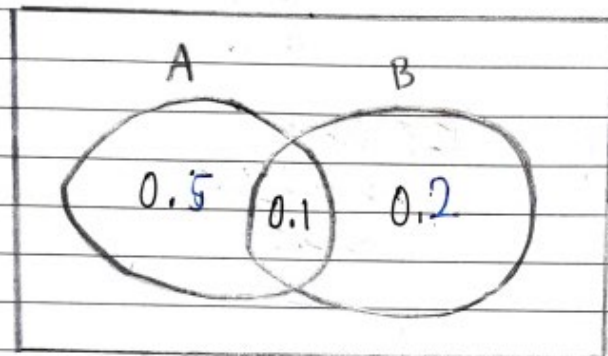
$$\begin{aligned} P(\overline{E \text{ or } A}) &= 1 - P(E \text{ or } A) \\ &= 1 - 0.2 \\ &= 0.8 \end{aligned}$$

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

Question 2

$$\begin{aligned} \text{a) } P(A \cap B) &= P(A) + P(B) - P(A \cup B) \\ &= 0.6 + 0.3 - 0.8 \\ &= 0.1 \end{aligned}$$

b)



$$\begin{aligned} \text{c) } P(A' \cap B) &= P(B) - P(A \cap B) \\ &= 0.3 - 0.1 \\ &= 0.2 \end{aligned}$$

$$\begin{aligned} \text{d) } P(A' \cap B') &= 1 - P(A \cup B) \\ &= 1 - 0.8 \\ &= 0.2 \end{aligned}$$

$$\begin{aligned} \text{e) } P(A' \cup B') &= P(A') + P(B') - P(A' \cap B') & P(A') &= 1 - P(A) & P(B') &= 1 - P(B) \\ &= 0.4 + 0.7 - 0.2 & &= 1 - 0.6 & &= 1 - 0.3 \\ &= 0.9 & &= 0.4 & &= 0.7 \end{aligned}$$

$$\begin{aligned} \text{f) } P(A \cap B') &= P(A) - P(A \cap B) \\ &= 0.6 - 0.1 \\ &= 0.5 \end{aligned}$$

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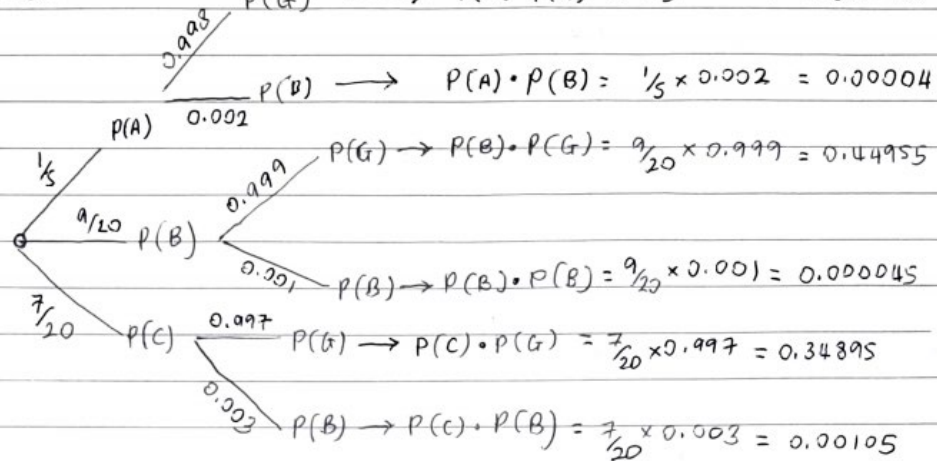
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Question 3

 $P(A) = 20\% \rightarrow$ ~~0.1998~~ $P(G) = \text{good service}$ $P(B) = 45\%$ $P(B) = \text{Bad service}$ $P(C) = 35\%$

$$P(G) \rightarrow P(A) \cdot P(G) = \frac{1}{5} \times 0.998 = 0.1996$$

a)



b)

$$= 0.1996 + 0.44955 + 0.34895$$

$$= 0.9981$$

c)

$$= 0.44955 + 0.000045$$

$$= 0.4496$$

Question 4

a) x is a binomial random variable

b) $P(X=8)$ $n=20$

~~$n=0.7$~~ $p=0.7$

~~$p=0.3$~~ $q=0.3$

$$P(8) = \binom{20}{8} (0.7)^8 (0.3)^{12}$$
$$= 0.00386$$

c) $P(10 \geq x \geq 7)$

$$= P(7) + P(8) + P(9) + P(10)$$

$$= \binom{20}{7} (0.7)^7 (0.3)^{13} + \binom{20}{8} (0.7)^8 (0.3)^{12}$$
$$+ \binom{20}{9} (0.7)^9 (0.3)^{11} + \binom{20}{10} (0.7)^{10} (0.3)^{10}$$

$$= 0.0001 + 0.0039 + 0.0120 + 0.0308$$

$$= 0.0468$$

d) $n=20$ $P(3 \leq x \leq 5)$

$$p=0.3 \quad = P(3) + P(4) + P(5)$$

$$q=0.7$$

$$= \binom{20}{3} (0.3)^3 (0.7)^{17} + \binom{20}{4} (0.3)^4 (0.7)^{16} + \binom{20}{5} (0.3)^5 (0.7)^{15}$$

$$= 0.0716 + 0.1304 + 0.0022$$

$$= 0.2042$$

Ans to the Ques-5

a) Probability that a given student will pass the test on third try;

$$\begin{aligned}P(x=3) &= b^*(3; 1, 0.7) \\&= \binom{3-1}{1-1} (0.7)^1 (0.3)^2 \\&= 0.063\end{aligned}$$

ii) before the fourth try

$$\begin{aligned}P(x < 4) &= P(1 \leq x \leq 3) \\&= P(x=1) + P(x=2) + P(x=3) \\&= b^*(1; 1, 0.7) + b^*(2; 1, 0.7) + b^*(3; 1, 0.7) \\&= \binom{1-1}{1-1} (0.7)^1 (0.3)^{1-1} + \binom{2-1}{1-1} (0.7)^1 (0.3)^1 \\&\quad + \binom{3-1}{0-1} (0.7)^1 (0.3)^2 \\&= 0.973\end{aligned}$$

iii) At the fifth after seventh try,

$$\begin{aligned}b^*(7; 5, 0.7) &= \binom{6}{4} (0.7)^5 (1-0.7)^{7-5} \\&= 0.2269\end{aligned}$$

$$b) \text{ Mean } \mu = \frac{k}{p} = \frac{5}{0.7} = 7.14$$

$$\text{variance}^2 = \frac{k(1-p)}{p^2} = 3.1$$

$$\therefore \sigma = 1.76$$

Ans to the Ques-6

a) x : amount of bag, $\mu = 36$ kg, $\sigma = 0.1$

$$P(X < 35.8) + P(X > 36.2)$$

$$Z = \frac{35.8 - 36}{0.1} \quad Z = \frac{36.2 - 36}{0.1}$$

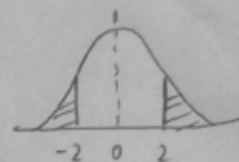
$$= -2$$

$$= 2$$

$$P(Z < -2) + P(Z > 2)$$

$$= 0.0228 + 0.0228$$

$$= 0.0456$$



b) Binomial distribution

- fixed number of trials
- independent

$$p = 0.0456, \quad n = 16, \quad x = 0$$

$$b^*(0; 16, 0.0456) = \binom{16}{0} 0.0456^0 (0.9544)^{16}$$

$$P(x=0) = 0.4739$$

$$c) P(x=1) = \binom{16}{1} (0.0456^1) (0.9544)^{15}$$

$$= 0.3458$$

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

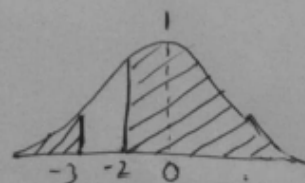
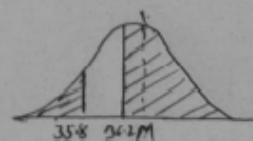
$$P(X < 35.8) + P(X > 36.2)$$

$$Z = \frac{35.8 - 37}{0.4} = -3 \quad Z = \frac{36.2 - 37}{0.4} = -2$$

$$1 - P(Z < -2) + P(Z < -3)$$

$$= 1 - 0.0228 + 0.0044$$

$$= 0.9756$$



Question 7

a)

$$P(20 \leq X \leq 40)$$

$$Z = \frac{20 - 28}{8}$$

$$= -1$$

$$Z = \frac{40 - 28}{8}$$

$$= 1.5$$

$$P(Z = -1) = 0.5 - 0.15866 \\ = 0.34134$$

$$P(Z = 1.5) = 0.93319 - 0.5 \\ = 0.43319$$

$$P(-1 \leq Z \leq 1.5) = 0.34134 + 0.43319 \\ = 0.77453$$

b) $P(X \leq 30)$

$$Z = \frac{30 - 28}{8} \\ = 0.25$$

$$P(Z = 0.25) = 0.59871$$

c) $P(Z) = 0.75$

$$Z = 0.68$$

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

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

$$X = (0.68)(8) + 28$$

$$X = 33.44 \text{ days}$$