



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING

SEMESTER II 2020/2021

SECI2143 PROBABILITY & STATISTICAL

DATA ANALYSIS

SECTION: 07

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ASSIGNMENT 2

GROUP 6: SISTHREEHOOD

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70/100

Question 1

- very easy $\Rightarrow P(A) = 0,08$
- easy $\Rightarrow P(B) = 0,29$
- Average $\Rightarrow P(C) = 0,34$
- Difficult $\Rightarrow P(D) = 0,17$
- Very difficult $\Rightarrow P(E) = 0,12$

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a) average, easy, or very easy

$$P(C \cup B \cup A) \leadsto P(C) + P(B) + P(A) = 0,34 + 0,29 + 0,08 = 0,71 //$$

b) Average, difficult, or very difficult

$$P(C \cup D \cup E) \leadsto P(C) + P(D) + P(E) = 0,34 + 0,17 + 0,12 = 0,63 //$$

c) Neither very difficult nor Very easy

$$P(E' \cup A') \leadsto P(E \cap A)' = 1 - P(E \cup A) = 1 - P(E) - P(A) = 1 - 0,12 - 0,08 = 0,80 //$$

d) Difficult or very easy

$$P(D \cup A) \leadsto P(D) + P(A) = 0,17 + 0,08 = 0,25 //$$

Question 2

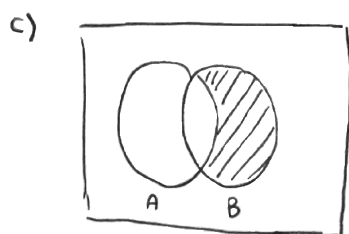
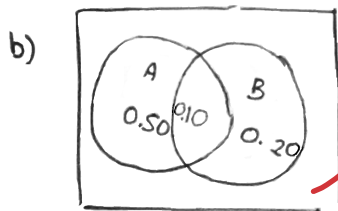
$$P(A) = 0,60 \quad P(B) = 0,30 \quad P(A \cup B) = 0,80$$

$$a) P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$0,80 = 0,60 + 0,30 - P(A \cap B)$$

$$P(A \cap B) = 0,10 //$$

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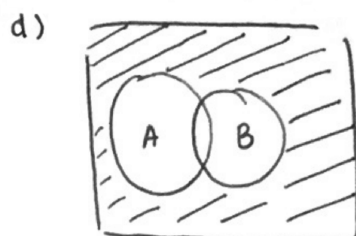


$$P(A' \cap B)$$

$$\leadsto P(B) - P(A \cap B) = 0,30 - 0,10$$

$$= 0,20 //$$

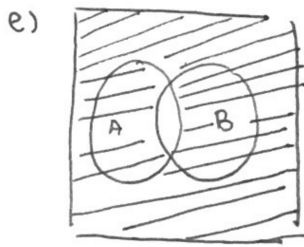
$$\leadsto A' = U - A$$



$$P(A' \cap B') = P(A \cup B)'$$

$$= 1 - 0,80$$

$$= 0,20 //$$

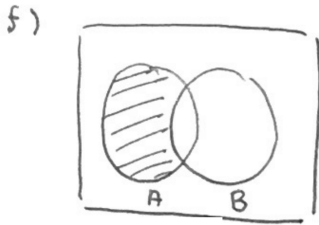


$$P(A' \cup B') = P(A \cap B)'$$

$$= 1 - 0,10$$

$$= 0,90$$

~~X~~



$$P(A \cap B')$$

$$\rightarrow P(A) - P(A \cap B) = 0,60 - 0,10$$

$$= 0,50$$

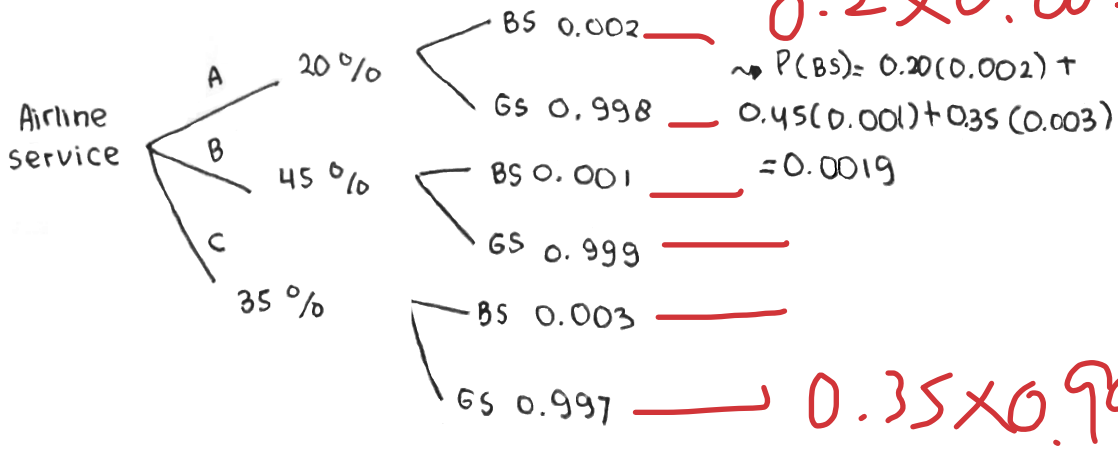
$$\rightarrow A - B$$

~~X~~

Question 3

• Package A : 20%	Bad service (Bs)
• Package B : 45%	$P(A) = 0.002$
• Package C : 35%	$P(B) = 0.001$
	$P(C) = 0.003$

a)



b) Good service (Gs)

$$P(Gs) = 0.20(0.998) + 0.45(0.999) + 0.35(0.997)$$

$$= 0.19960 + 0.44955 + 0.34895$$

$$= 0.9981$$

c) Probability in Package B

$$P(B|Gs)$$

$$= \frac{0.45(0.999)}{0.9981} = \frac{0.44955}{0.9981}$$

$$= 0.45040577$$

$$= 0.4504$$

~~X~~

$$P(Gs|B)$$

$$= \frac{P(Gs \cap B)}{P(B)}$$

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Question 4

a) Binomial random variable

$$b) P(X=8) = b(8; 20, 0.7) = \binom{20}{8} 0.7^8 0.3^{12} = 0.0039$$

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$$\begin{aligned} c) P(7 \leq X \leq 10) &= P(X=7) + P(X=8) + P(X=9) + P(X=10) \\ &= b(7; 20, 0.7) + b(8; 20, 0.7) + b(9; 20, 0.7) + b(10; 20, 0.7) \\ &= \binom{20}{7} 0.7^7 0.3^{13} + \binom{20}{8} 0.7^8 0.3^{12} + \binom{20}{9} 0.7^9 0.3^{11} + \binom{20}{10} 0.7^{10} 0.3^{10} \\ &= 0.001 + 0.0039 + 0.012 + 0.0308 \\ &= 0.0477 \end{aligned}$$

$$\begin{aligned} d) P(3 \leq X \leq 5) &= P(X=3) + P(X=4) + P(X=5) \\ &= b(3; 20, 0.3) + b(4; 20, 0.3) + b(5; 20, 0.3) \\ &= \binom{20}{3} 0.3^3 0.7^{17} + \binom{20}{4} 0.3^4 0.7^{16} + \binom{20}{5} 0.3^5 0.7^{15} \\ &= 0.0716 + 0.1304 + 0.1789 \\ &= 0.3809 \end{aligned}$$

Question 5

$$a) i) P(X=3) = (1-0.7)^{3-1} 0.7 = 0.063$$

$$\begin{aligned} ii) P(X < 4) &= P(1 \leq X \leq 3) = P(X=1) + P(X=2) + P(X=3) \\ &= (1-0.7)^0 0.7 + (1-0.7)^1 0.7 + (1-0.7)^2 0.7 \\ &= 0.7 + 0.7 + 0.063 \\ &= 0.973 \end{aligned}$$

$$iii) P(X=12) = (1-0.7)^{11} 0.7 = 0.00000124$$

$$b) \text{mean} = \mu_X = \frac{1}{p} = \frac{1}{0.7} = 1.4286$$

$$\text{Variance} = \sigma_X^2 = \frac{(1-p)}{p^2} = \frac{1-0.7}{0.7^2} = 0.6122$$

$$b^*(7; 5, 0.7)$$

$$\mu = \frac{5}{0.7} =$$

$$\sigma^2 = \frac{5(1-0.7)}{(0.7)^2} =$$

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Question 6

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$$\mu = 36, \sigma = 0.1$$

a) Let X be probability bag declared out of control.

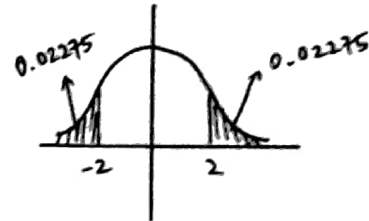
$$P(X < 35.8) + P(X > 36.2)$$

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

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

$$= 0.02275 + (1 - 0.97725)$$

$$= 0.0455$$



b) Let p be probability out of control. $p = 0.0455$

$$\begin{aligned} n &= 16, q = 1 - p \\ &= 1 - 0.0455 \\ &= 0.9545 \end{aligned}$$

$$\begin{aligned} P(X = 0) &= b(x; n, p) \\ &= b(0; 16, 0.0455) \\ &= \binom{16}{0} (0.0455)^0 (0.9545)^{16} \\ &= 0.4747 \end{aligned}$$

$$\begin{aligned} c) P(X = 1) &= b(x; n, p) \\ &= b(1; 16, 0.0455) \\ &= \binom{16}{1} (0.0455)^1 (0.9545)^{15} \\ &= 0.3621 \end{aligned}$$

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

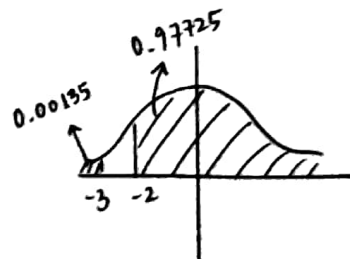
$$P(X < 35.8) + P(X > 36.2)$$

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

$$= P(Z < -3) + P(Z > -2)$$

$$= 0.00135 + (1 - 0.02275)$$

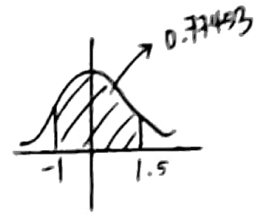
$$= 0.9786$$



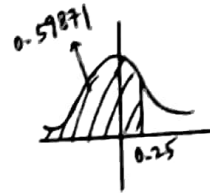
Question 7

a) $\mu = 28, \sigma = 8$

$$\begin{aligned} P(20 \leq X \leq 40) &= P\left(\frac{20-28}{8} \leq Z \leq \frac{40-28}{8}\right) \\ &= P(-1 \leq Z \leq 1.5) \\ &= P(Z \leq 1.5) - P(Z \leq -1) \\ &= 0.93319 - 0.15866 \\ &= 0.77453 \\ &= 77.453\% \end{aligned}$$

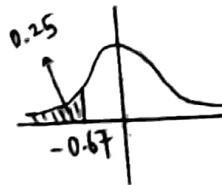


b) $P(X < 30) = P\left(Z < \frac{30-28}{8}\right)$
 $= P(Z < 0.25)$
 $= 0.59871$
 $= 59.871\%$



c) $P(X > x) = 0.75$
 $P(X \leq x) = 1 - 0.75$
 $= 0.25$
 $P\left(Z \leq \frac{x-28}{8}\right) = 0.25$
 $P(Z \leq -0.67) = 0.25$

$$\begin{aligned} Z &= \frac{x - \mu}{\sigma} \\ -0.67 &= \frac{x - 28}{8} \\ -5.36 &= x - 28 \\ x &= 22.64 \\ &\approx 23 \text{ days} \end{aligned}$$



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