



Aimel Hasan - Assignment 6 (I20-0203)

Probability and statistics (National University of Computer and Emerging Sciences)

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Assignment # 6

ASSIGNMENT#6

QUESTION#1

$Z \rightarrow$ Standard Quantity

$X \rightarrow$ Plan 1

$Y \rightarrow$ Plan 2

$$P(Z/X) = 85/100$$

$$P(Z/Y) = 65/100$$

$$P(X \cdot Z) = 0.8 \times 0.85 = 0.68$$

$$P(Y \cdot Z) = 0.2 \times 0.65 = 0.13$$

$$P(Y/Z) = \frac{P(Y \cap Z)}{P_Z}$$

$$= \frac{0.13}{0.68 + 0.13}$$

$$= 0.16049$$

QUESTION#2

$T = 54$ members

6 selected

\rightarrow 4 winning & 2 not winning

$$(i) \frac{\binom{6}{c} \binom{48}{c}}{\binom{54}{c}} = 0.000655$$

$$(ii) \frac{\binom{6}{c} \binom{48}{c} + \binom{6}{c} \binom{48}{c}}{\binom{54}{c}} = 0.873$$

QUESTION # 3

$$a) P(B/P) = \frac{P(B \cap P)}{P(P)}$$

$$P(B \cap P) = P(B) \times P(P) \\ = \frac{116}{450} \times \frac{50}{450} = \frac{58}{2025} = 0.028641$$

$$P(P) = \frac{50}{450} = 0.1111$$

$$P(B/P) = \frac{0.028641}{0.1111} = 0.25778$$

$$b) P(G/P) = \frac{P(G \cap P)}{P(P)} = \frac{0.0824}{0.1111} = 0.7422$$

$$P(G \cap P) = \frac{167}{225} \times \frac{50}{450} = 0.0824$$

$$c) P(G \cap NP) = P(G) \cdot P(NP)$$

$$\frac{320}{450} = \frac{334}{450} \times \frac{400}{450}$$

$$0.7111 \neq 0.6598$$

G & NP are dependent events

QUESTION#4

D'	D	T
3	2	5
2	0	2
1	1	2
0	2	2

X →	0	1	2
P(X) →	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{2}{5}$

$\sum f(x_i) = 1$ & all frequencies are greater than 0 so it is a frequency distribution table.

QUESTION#5

a)	X	PX	$\sum x > P(x)$	
	0	0.35	0	
	1	0.30	0.30	$E(X) = \mu = \sum x P(x)$
	2	0.10	0.20	$= 0 + 0.30 + 0.20 + 0.45$
	3	0.15	0.45	$+ 0.40$
	4	0.10	0.40	$= 1.35$

$$\text{Var}(-6X) = (-6)^2 \text{Var} X = 36 \text{Var} X$$

$$\begin{aligned}\text{Var}(X) &= (0-1.35)^2 \times 0.35 + (1-1.35)^2 \times 0.30 + (2-1.35)^2 \times 0.10 \\ &\quad + (3-1.35)^2 \times 0.15 + (4-1.35)^2 \times (0.10) \\ &= 36(1.82665) = 65.7594\end{aligned}$$

$$\begin{aligned} b) E(4X-3) &\rightarrow 4E(X)-3 \\ &\rightarrow 4(1.35)-3 = 2.4 \end{aligned}$$

$$c) E(4X-3) = 2.4 \quad E(X) = 1.35$$

$$4E(X)-3 = 4(1.35)-3 = 2.4$$

$$4E(X)-3 = E(4X-3) \text{ hence proved}$$

QUESTION # 6

$$P(A) = \frac{1}{3} \quad P(B) = \frac{3}{4} \quad P(A \cap B) = \frac{1}{12}$$

$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{\frac{1}{12}}{\frac{1}{3} + \frac{3}{4}} = \frac{1}{13}$$

$$= 0.0769$$

QUESTION # 7

$$\begin{aligned} P(D) &= P(A \cap D) + P(B \cap D) + P(C \cap D) \\ &= P(A)P(D|A) + P(B)P(D|B) + P(C)P(D|C) \\ &= (0.07 \times 0.3) + (0.03 \times 0.2) + (0.20 \times 0.5) \\ &= \frac{19}{200} = 0.095 \end{aligned}$$

$$P(A|D) = \frac{P(A \cap D)}{P(D)}$$

$$= \frac{0.07 \times 0.3}{0.095} = \frac{3}{19}$$

QUESTION # 8

$$\begin{aligned} \text{i) } E(X) &= \sum X \cdot P(X) \\ &= (80 \times 0.2) + (200 \times 0.5) + (220 \times 0.3) \\ &= 180 \end{aligned}$$

$$\begin{aligned} V(X) &= \sum X^2 P(X) - [E(X)]^2 \\ &= [(6400 \times 0.2) + (40000 \times 0.5) + (48400 \times 0.3)] - (180)^2 \\ &= 3400 \end{aligned}$$

$$C.V = \frac{S.D}{\text{mean}} \times 100$$

$$\frac{\sqrt{3400}}{180} \times 100 = 32.3942$$

$$\text{ii) } P\left(Z = \frac{X - \mu}{\sigma}\right) \Rightarrow P\left(Z = \frac{X - 200}{20}\right)$$

$$\therefore \mu = 200 \quad \sigma = 20$$

$$C.V = \frac{20}{200} \times 100$$

$$= 10$$

$$V(X) = 20^2 = 400$$