Assignment # 1

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Question -1

(A)

(a)

$S = \{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

(b)

$S = \{(x,y) \mid x \in \{1,2,3,4,5,6\} \text{ and } y \in \{1,2,3,4,5,6\}\}$

(B)

(a)

$A = \{(3,6),(4,5),(4,6),(5,4),(5,5),(5,6),(6,3),(6,4),(6,5),(6,6)\}$

(b)

$B = \{(1,2),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,2),(4,2),(5,2),(6,2)\}$

(c)

$C = \{(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

d, $A \cap C$

$A \cap C = \{(5,4), (5,5), (5,6), (6,3), (6,4), (6,5), (6,6)\}$

e,

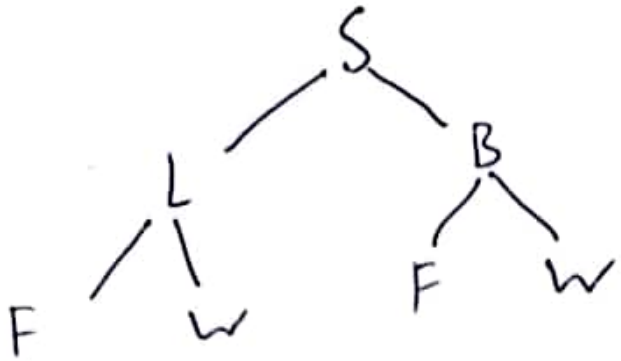
$A \cap B = \{\}$

f,

$B \cap C = \{(5,2), (6,2)\}$

Question-2

A,



B,

$P[W] = P[BW] + P[LW]$

$= 0.2 + 0 = 0.2$

$P[B] = P[BF] + P[BW]$

$= 0.2 + 0.2 = 0.4$

$P[W \cup B] = P[LW] + P[BW] + P[BF]$

$= 0 + 0.2 + 0.2$

$= 0.4$

P[•]	S	F
L	0	0.5
B	0.2	0.2

Question - 3

A,

$$P(m) = \frac{\binom{k}{m} \cdot \binom{100-k}{M-m}}{\binom{100}{m}}$$

k = no. of defective items.

M = number of items choosen at random.

m = no. of defective items found among chosen items.

~~P(0) : $\frac{\binom{10}{0} \cdot \binom{90}{5}}{\binom{100}{5}} = 1$.~~

$$P(0) = \frac{\binom{10}{0} \cdot \binom{90}{5}}{\binom{100}{5}}$$

~~P(1) :~~

The number of way of choosing M-m non-defe-ctives out of 100-k non-def is $\binom{100-k}{M-m}$

Hence the no. of ways of choosing m defective out of K & M-m non-defectives out 100-k is :-

$$\binom{k}{m}\binom{100-k}{M-m}$$

$$P_M(m) = \frac{\binom{k}{m}\binom{100-k}{M-m}}{\binom{100}{M}}$$

B,

P(Accepted) for m=0 & m=1 ≤900

$$P(\text{Accepted}) = P(0) + P(1) = \frac{\binom{100-k}{m} + k\binom{100-k}{m-1}}{\binom{100}{m}}$$

$$= \frac{\binom{k}{0}\cdot\binom{99}{5}}{\binom{100}{5}} + \frac{\binom{k}{1}\cdot\binom{99}{5}}{\binom{100}{5}}$$

C

Question-4

$P(1) = 0.01 \quad P(2) = 0.03 \quad P(3) = 0.02$

$P(4) = 0.01 \quad P(T) = \frac{1}{4} = 0.25$

Probability of working $= P(1) \times P(2) \times P(3) \times P(4)$

$= 0.99 \times 0.98 \times 0.97 \times 0.99$

$= 0.932$

Prob of fail $= 1 - 0.932 = 0.068$

A, $P(T \cap F) = 0.25 \times 0.068 = 0.017$

B, $P(2 \text{ or } 3 / T) = \frac{P(2 \cup 3) \cap (T)}{P(T)} = \frac{0.05 \times 0.0006 \times 0.25}{0.25}$

C, $P(R) = n \times P(F)$ $= 0.494$

$= 100 \times 0.068 \approx 0.7$

d, $P(T|D) = \frac{(0.25)(0.068)}{(0.068)} = 0.25$

Question-5

$P(R) = 0.20$, $P(S) = 0.50$, $P(L) = 0.30$

$P(F|R) = 0.05$, $P(F|S) = 0.04$, $P(F|L) = 0.08$

Using Baye's rule

(a) $P(F) = P(R) \times P(R) + P(S) \cdot P(F|S) + P(L) \times P(F|L)$

$= 0.2 \times 0.05 + 0.5 \times 0.04 + 0.3 \times 0.08$

$= 0.054$

(b) $P(L|F) = \frac{P(L) \times P(F|L)}{P(F)} = \frac{0.024}{0.054}$

$\simeq 0.444$