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SUBJECT:- PROBABILITY

DATE:- 19 AUG 2020

DEPARTMENT:- BE (E)

SUMMER

(9)
Q1

Solutions-

Resistance	Tolerance		Total
	5%	10%	
22	10	14	24
47	28	16	44
100	24	8	32
total	62	38	100

Event,

A = Draw a 47 resistor.

B = Draw a 5% tolerance.

C = Draw a 100 resistor.

D = Draw a 22 ohm resistor.

E = Draw a 10% tolerance.

 $P(A|B) = ?$, $P(A|C) = ?$, $P(B|C)$, $P(D|E) = ?$

$$P(A) = P(47\Omega) = \frac{44}{100}$$

$$P(B) = P(5\%) = \frac{62}{100}$$

$$P(C) = P(100\Omega) = \frac{32}{100}$$

$$P(D) = P(22\Omega) = \frac{24}{100}$$

$$P(E) = P(10\%) = \frac{38}{100}$$

Now Find the joint Probability

$$P(A \cap B) = P(47\% \cap 5\%) = \frac{28}{100}$$

$$P(B \cap C) = P(5\% \cap 100\%) = \frac{24}{100}$$

$$P(A \cap C) = P(47\% \cap 100\%) = 0$$

$$P(D \cap E) = P(22\% \cap 10\%) = \frac{14}{100}$$

Now find the conditional Property

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{28/100}{62/100} = \frac{28}{62} = \frac{14}{31}$$

$$P(A|C) = \frac{P(A \cap C)}{P(C)} = \frac{0}{32/100} = 0$$

$$P(B|C) = \frac{P(B \cap C)}{P(C)} = \frac{24/100}{32/100} = \frac{24}{32} = \frac{3}{4}$$

$$P(D|E) = \frac{P(D \cap E)}{P(E)} = \frac{14/100}{38/100} = \frac{14}{38} = \frac{7}{19}$$

Q1

(b)

Solution:-

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

$$\text{Each with } (P) = \frac{1}{36}$$

$$\text{Sum of } \{7 \xi\} = (6, 1), (5, 2), (4, 3), (3, 4), (2, 5), (1, 6), (6, 5), (5, 6)$$

$$\text{Therefore } P(\text{sum of } 7 \xi) = \frac{8}{36} = \frac{2}{9}$$

Ans

Q1

(C)

Solutions-

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

$$P(S) = \frac{1}{36}$$

$$P(\text{sum of 6 or less}) = P(A) = \{ (1,4), (2,4) \\ (1,1), (4,2) \} \\ = \frac{4}{36} = \frac{1}{9}$$

$$P(A \text{ wins}) = \frac{1}{9}$$

$$P(\text{sum of 5 or more}) = P(B) = \{ (1,4), (2,4), (3,4) \\ (4,4), (5,4), (6,4) \\ (4,6), (4,1), (4,2) \\ (4,3), (4,5) \}$$

$$= \frac{11}{36}$$

$$P(B \text{ wins}) = \frac{11}{36}$$

$$P(A \& B \text{ win}) = P(A \text{ wins}) = \frac{4}{36} \text{ because}$$

$$A \subset B$$

Q2

(A)

Solution:-

$$\text{Formula } \binom{N}{k} (p)^k (1-p)^{N-k}$$

$$\binom{4}{k} (0.3)^k (1-0.3)^{4-k}$$

$$1-0.3=0.7$$

P(Late 3 or more times) =

$$= \binom{4}{3} (0.3)^3 (0.7)^1 + \binom{4}{4} (0.3)^4 (0.7)^0$$

$$= \left(\frac{4 \times 3!}{3!} \right) (0.027) (0.7) + \left(\frac{4!}{4!} \right)$$

$$(0.3)^4 (1)$$

$$= 0.756 + 0.0081$$

$$= \boxed{0.837}$$

$$P(\text{Not late at all}) = \binom{4}{0} (0.3)^0 (0.7)^4$$

$$= \boxed{0.2401}$$

Ans

(b)
Q2

Solution

$$N=6$$

$$P(\text{PPPLand in recovery zone})=0.8$$

$$\begin{aligned} \text{(a)} \quad P(\text{None in zone}) &= \binom{6}{0} (0.8)^0 (1-0.8)^6 \\ &= (0.2)^6 \\ &= 0.000064 \\ &= (6.4 \times 10^{-5}) \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad P(\text{at least one in zone}) &= \\ &= 1 - P(\text{none in zone}) \\ &= 1 - 6.4 \times 10^{-5} \\ &= 0.999936 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad P(\text{success}) &= P(3 \text{ in zone}) + P(4 \text{ in zone}) \\ &\quad + P(5 \text{ in zone}) + P(6 \text{ in zone}) \end{aligned}$$

$$\begin{aligned} &= \binom{6}{3} (0.8)^3 (0.2)^2 + \binom{6}{4} (0.8)^4 (0.2)^2 \\ &\quad + \binom{6}{5} (0.8)^5 (0.2)^1 + \binom{6}{6} (0.8)^6 (0.2)^0 \end{aligned}$$

(7)

$$\left(\frac{6 \times 5 \times 4 \times 3!}{8!}\right) (0.512) (0.008) + \left(\frac{6 \times 5 \times 4!}{8!}\right)$$

$$(0.4096) (0.04) + \left(\frac{6 \times 5!}{8!}\right) (0.32768)$$

$$(0.2) + \left(\frac{6!}{8!}\right) (0.262144) (1)$$

$$= (0.983) \text{ Yes this Program is successful.}$$

Q2 (c)

Solution:-

$$P(A) = P(\text{Face card}) = \frac{12 \times 4^3}{52 \times 26} = \frac{3}{13}$$

$$P(B) = P(\text{5 or smaller}) = \frac{16}{52} = \frac{4}{13}$$

$$P(\bar{B}) = P(\text{card is 10}) = \frac{4}{52} = \frac{1}{13}$$

Ans

Rough Work

Face card Queen 4
king 4
Jack 4 $\rightarrow 12$

5 or smaller
2 $\rightarrow 4$
3 $\rightarrow 4$
4 $\rightarrow 4$
5 $\rightarrow 4$ $\rightarrow 16$

10 card = $[4] \rightarrow [2 \text{ Black}] + [2 \text{ Red}]$