Solutions | Worksheet No: 2 | Probability (12th)

Qus: 1 → Given: A & B are independent

i.e $P(A \cap B) = P(A) \cdot P(B)$

T.P $P(A \cup B) = 1 - P(A') \cdot P(B')$

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

$= P(A) + P(B) - P(A) \cdot P(B)$ --- {Given}

$= P(A) + P(B)(1 - P(A))$

$= P(A) + P(B) \cdot P(A')$

$= 1 - P(A') + P(B) \cdot P(A')$

$= 1 - P(A')\{1 - P(B)\}$

$= 1 - P(A') \cdot P(B')$

$= RHS$ PROVED

Qus: 3 →

Given $P(A) = 1/2$; $P(A \cup B) = \frac{3}{5}$

$P(B) = p$

(i) A & B are Independent

$\therefore P(A \cap B) = P(A) \cdot P(B)$

Now we have $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow \frac{3}{5} = \frac{1}{2} + P(B) - P(A) \cdot P(B)$ --- (Given)

$\Rightarrow \frac{3}{5} = \frac{1}{2} + p - \frac{1}{2} \cdot p$

$\Rightarrow \frac{3}{5} - \frac{1}{2} = \frac{p}{2}$

$\Rightarrow \frac{1}{10} = \frac{p}{2}$

$\Rightarrow \boxed{p = 1/5}$ Ans

(2) A & B are mutually exclusive

$\therefore P(A \cap B) = 0$

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

$\Rightarrow \frac{3}{5} = \frac{1}{2} + p - 0$

$\Rightarrow p = \frac{3}{5} - \frac{1}{2}$

$\Rightarrow \boxed{p = \frac{1}{10}}$ Ans

Ques 3 → Given $P(A) = 1/2$; $P(B) = \frac{7}{12}$

$P(A' \cup B') = \frac{1}{4}$

we have $P(A' \cup B') = P(A \cap B)'$ --- { de morgan's law

$\frac{1}{4} = 1 - P(A \cap B)$

$\Rightarrow P(A \cap B) = 1 - \frac{1}{4}$

$\Rightarrow P(A \cap B) = 3/4$

Now $P(A) \cdot P(B) = \frac{1}{2} \times \frac{7}{12} = \frac{7}{24}$

Clearly $P(A \cap B) \neq P(A) \cdot P(B)$

$\therefore$ Events A & B are not independent Ans

Ques 4 → Given $P(A) = 0.3$; $P(B) = 0.4$

A & B are independent

$\therefore P(A \cap B) = P(A) \cdot P(B)$

(i) $P(A \cap B) = P(A) \cdot P(B)$

$P(A \cap B) = (0.3)(0.4) = 0.12$ Ans

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

$= 0.3 + 0.4 - 0.12$

$= 0.58$ Ans

(iii) $P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{0.12}{0.4} = 0.3$ Ans

(iv) $P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{0.12}{0.3} = 0.4$ Ans

Qn 5 → (i) Let A → the first ball drawn is Black

Let B → 2nd ball drawn is Red

Required Prob $= P(A) \cdot P(B/A)$ (Or) $= P(A) \cdot P(B)$

$= \frac{10}{18} \times \frac{8}{18}$ {Since with Replacement (Independent Events)}

$= \frac{20}{81}$

(2) Two Cases Case I: 1st is black & 2nd is Red

Case II: 1st is Red and 2nd is black

Let A → getting Black in 1st & Red in second

$P(A) = \frac{10}{81} \times \frac{8}{81} = \frac{20}{81}$

Let B → getting Red in 1st & Black in 2nd

$P(B) = \frac{8}{81} \times \frac{10}{81} = \frac{20}{81}$

Required probability = $P(A) + P(B)$

$= \frac{20}{81} + \frac{20}{81}$

$= \frac{40}{81}$ Ans

Qn. 6 →

Let A → getting good orange in I^{st} draw

B → " " " " 2^{nd} draw

C → " " " " 3^{rd} draw

$P(A) = \frac{12}{15}$; $P(B/A) = \frac{11}{14}$; $P(C/A \cap B) = \frac{10}{13}$

Box will be approved for sale when all the three oranges are good

$\therefore$ Required Prob $= \frac{12}{15}^{4} \times \frac{11}{14} \times \frac{10}{13}^{2}$

$= \frac{4}{5} \times \frac{11}{7}$

$= \frac{44}{91}$ Ans

Qn. 7 →

Even prime number = {2}

Prob of getting even prime number of any dice = $\frac{1}{6}$

Prob of getting even prime number both dice = $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$ Ans

(OR)

Format use :-

A → getting even prime number on I^{st} dice.

B → " " " " on 2^{nd} dice

$P(A) = \frac{1}{6}$; $P(B/A) = 1/6$ Req prob $= P(A) \cdot P(B/A) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$ Ans

Qn. 8 → let X → denotes the number of aces

X → can take values 0, 1, 2

$P(x=0) = P(\text{getting no ace}) = \frac{48}{52} \times \frac{48}{52} = \frac{144}{169}$

$P(x=1) = P(\text{getting 1 ace}) = \left(\frac{4}{52} \times \frac{48}{52}\right) \times 2 = \frac{24}{169}$

$P(x=2) = P(\text{getting 2 aces}) = \frac{4}{52} \times \frac{4}{52} = \frac{1}{169}$

∴ P.D

x	0	1	2
P(x)	144/169	24/169	1/169

Ans

Qn. 9 → let X → denotes the number of doubles

X → can take values 0, 1, 2, 3

doubles = {(1,1), (2,2), (3,3) (4,4) (5,5) (6,6)}

$P(x=0) = P(\text{getting No double}) = \frac{30}{36} \times \frac{30}{36} \times \frac{30}{36} = \frac{125}{216}$

$P(x=1) = P(\text{getting 1 double}) = \left(\frac{6}{36} \times \frac{30}{30} \times \frac{30}{36}\right) \times 3 = \frac{75}{216}$

$P(x=2) = P(\text{getting 2 doubles}) = \left(\frac{6}{36} \times \frac{6}{36} \times \frac{30}{36}\right) \times 3 = \frac{15}{216}$

$P(x=3) = P(\text{getting 3 doubles}) = \frac{6}{36} \times \frac{6}{36} \times \frac{6}{36} = \frac{1}{216}$

P.D

x	0	1	2	3
P(x)	125/216	75/216	15/216	1/216

Ans

Q4|10

we know that $\sum p_i = 1$

$\Rightarrow 0 + k + 2k + 2k + 3k + k^2 + 2k^2 + 7k^2 + k = 1$

$\Rightarrow 10k^2 + 9k = 1$

$\Rightarrow 10k^2 + 9k - 1 = 0$

$\Rightarrow 10k^2 + 10k - k - 1 = 0$

$\Rightarrow 10k(k+1) - 1(k+1) = 0$

$\Rightarrow (10k - 1)(k+1) = 0$

$\Rightarrow$ $k = -1$ (rejected (prob. can't be -ve)) $\quad k = 1/10$

(i) $k = 1/10$ Ans

(2) $P(0 \leq x < 3) = P(x=1) + P(x=2)$

$= k + 2k = 3k$

$= \frac{3}{10}$ Ans

Q4 11 ⋆ total bulbs = 30

good = 24 ; defective = 6

Let $X \rightarrow$ denotes the number of defective bulbs

$X \rightarrow$ can take values $0, 1, 2, 3, 4$

$P(X=0) = P(\text{getting No defective bulb}) = \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30}$

$= \frac{256}{625}$

$P(X=1) = P(\text{getting 1 defective bulb}) = \left(\frac{6}{30} \times \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30}\right) \times {}^4C_1$

$= \left(\frac{1}{5} \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5}\right) \times 4$

$= \frac{256}{625}$

$P(X=2) = P(\text{getting 2 defective bulbs})$

$= \left(\frac{6}{30} \times \frac{6}{30} \times \frac{24}{30} \times \frac{24}{30}\right) \times {}^4C_2$

$= \left(\frac{1}{5} \times \frac{1}{5} \times \frac{4}{5} \times \frac{4}{5}\right) \times 6 = \frac{96}{625}$

$P(X=3) = P(\text{getting 3 defective bulbs})$

$= \left(\frac{6}{30} \times \frac{6}{30} \times \frac{6}{30} \times \frac{24}{30}\right) \times {}^4C_3$

$= \left(\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{4}{5}\right) \times 4 = \frac{16}{625}$

$P(X=4) = P(\text{getting 4 defective bulbs}) = \frac{6}{30} \times \frac{6}{30} \times \frac{6}{30} \times \frac{6}{30}$

$= \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} = \frac{1}{625}$

P.D

X	0	1	2	3	4
P(X)	$\frac{256}{625}$	$\frac{256}{625}$	$\frac{96}{625}$	$\frac{16}{625}$	$\frac{1}{625}$

Ans

Qn 12 → Let X → denotes the number obtained

X → can take values 1, 2, 5

$P(X=1) = \frac{3}{6}$

$P(X=2) = \frac{2}{6}$

$P(X=5) = \frac{1}{6}$

∴ P.D

X	1	2	5
P(X)	3/6	2/6	1/6

Ans

Qn 13 →

$P(\text{getting 1 on any dice}) = \frac{1}{6}$

$P(\text{not getting 1 on any dice}) = \frac{5}{6}$

let $X \rightarrow$ denotes the numbers of 1 seen

$X \rightarrow$ can take values $0, 1, 2$

$P(X=0) = P(\text{no one's on any dice}) = \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$

$P(X=1) = P(\text{getting 1 on one dice}) = \left(\frac{1}{6} \times \frac{5}{6}\right) + \left(\frac{5}{6} \times \frac{1}{6}\right)$

$= \frac{10}{36}$

$P(X=2) = P(\text{getting 1 on both the dice})$

$= \frac{1}{6} \times \frac{1}{6}$

$= \frac{1}{36}$

$\therefore$ P.D

X	0	1	2
P(x)	25/36	10/36	1/36

Any