Solutions WORKSHEET No: 3 PROBABILITY

(CLASS No: 4)

Q Ans 1 →

total No of ways of arrangement of 6 boys & 6 girls
$= 12!$

(·) Consider all 6 girls as one
(·) Now we have to arrange $(6+1) = 7$ persons
(·) which they can arranged in $7!$ ways
(·) 6 girls can mutually arranged in $6!$ ways

∴ favourable No of ways $= 7! \times 6!$

Required probability = $\frac{\text{favour ways}}{\text{total ways}}$

$$= \frac{7! \times 6!}{12!}$$

$$= \frac{\cancel{7!} \times 6!}{12 \times 11 \times 10 \times 9 \times 8 \times \cancel{7!}}$$

$$= \frac{\cancel{6} \times \cancel{5} \times \cancel{4} \times 3 \times \cancel{2} \times 1}{\overset{}{\underset{2}{\cancel{12}}} \times 11 \times \underset{2}{\cancel{10}} \times \underset{3}{\cancel{9}} \times \underset{2}{\cancel{8}}}$$

$$= \frac{1}{2 \times 11 \times 2 \times 3}$$

$$\boxed{\text{Req prob} = \frac{1}{132}}$$ Ans

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Ans 2 →

total no. of ways of getting / selecting two cards from 52 cards = $^{52}C_2$

favour ways : two cards are of different colours

$= 1R \,\&\, 1B$

$= {}^{26}C_1 \times {}^{26}C_1$

Required prob = $\dfrac{\text{favour ways}}{\text{total ways}}$

$$= \frac{{}^{26}C_1 \times {}^{26}C_1}{{}^{52}C_2}$$

$$= \frac{26 \times 26}{\frac{52 \times 51}{2}}$$

$$= \frac{\cancel{26} \times 26 \times \cancel{2}}{\cancel{52} \times 51}$$

$\boxed{\text{Required prob} = \frac{26}{51}}$ ANS

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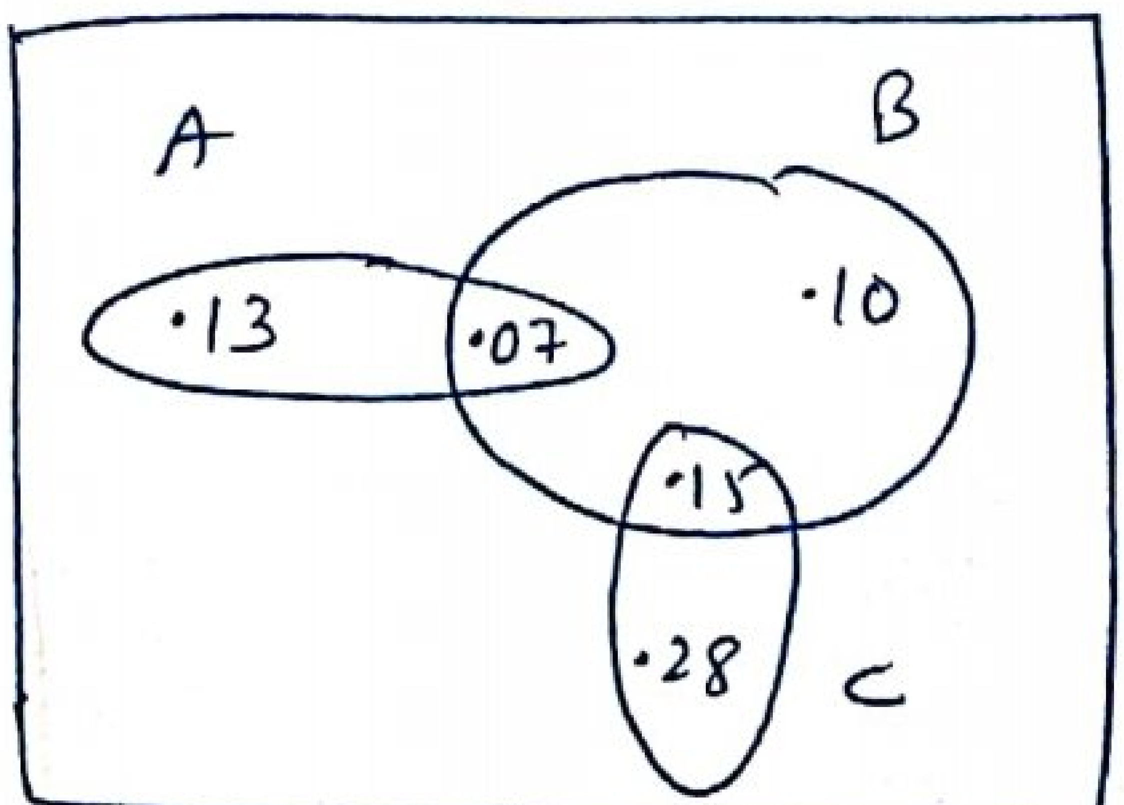
Ans 3 →



(1) $P(A) = .13 + .07$
$= 0.20$

(2) $P(B \cap C') = 0.07 + 0.10$
$= 0.17$

(3) $P(A \cup B) = .13 + .07 + .10 + .15 = 0.45$

(d) $P(A \cap B') = 0.13$

(e) $P(B \cap C) = 0.15$

(f) P(~~A∩C~~)
P(exactly one of three occur) = $0.13 + 0.10 + 0.28$
$= 0.51$

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Q. 4 → ALGORITHM

total letters = 9 {all different}

total No of ways of arrangement of 9 letters = 9!

(·) Consider GOR = 1 letter GOR = 1

(·) Now we have to arrange (6+1) = 7 letters

(·) that can be arranged in 7! ways

(·) GOR can mutually arranged in 1! ways = 1 way only IMP

(·) favourable no. of ways = $7! \times 1 = 7!$

Required prob = $\dfrac{\text{favour. ways}}{\text{total ways}}$

$= \dfrac{7! \times 1}{9!}$

$= \dfrac{\cancel{7!} \times 1}{9 \times 8 \times \cancel{7!}}$

$= \dfrac{1}{9 \times 8}$

$\boxed{\text{Req prob} = \dfrac{1}{72}}$ Ans

Note GOR
{Don't mutually arrange}
we want only GOR
{not OGR, ROG, ------}

Qn 5 →

given $P(A \cup B) = 1/2$

$P(A') = \frac{2}{3}$

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

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

$\Rightarrow P(A \cup B) = (1 - P(A')) + (P(B) - P(A \cap B))$

$\Rightarrow P(A \cup B) = 1 - P(A') + P(B \cap A')$

$\Rightarrow \frac{1}{2} = 1 - \frac{2}{3} + P(B \cap A')$

$\Rightarrow P(B \cap A') = \frac{1}{2} - 1 + \frac{2}{3}$

$\Rightarrow P(B \cap A') = \frac{3 - 6 + 4}{6}$

$\Rightarrow \boxed{P(A' \cap B) = \frac{1}{6}}$ Ans

Qn. 6 →

given $3P(A) = 2P(B) = P(C)$

given A, B, C are mutually exclusive and exhaustive events

$\Rightarrow P(A) + P(B) + P(C) = 1$

$\Rightarrow \frac{P(C)}{3} + \frac{P(C)}{2} + P(C) = 1$ --- {from given}

$$\Rightarrow \frac{2P(C) + 3P(C) + 6P(C)}{6} = 1$$

$$\Rightarrow 11P(C) = 6$$

$$\Rightarrow P(C) = \frac{6}{11}$$

Given $P(A) = \frac{1}{3} P(C)$

$$\Rightarrow P(A) = \frac{1}{3}\left(\frac{6}{11}\right)$$

$$\Rightarrow \boxed{P(A) = \frac{2}{11}}$$ Ans

Qn. 7 → Given: $P(A) = 0.3$; $P(B) = 0.5$; $P(C) = 0.7$

$P(A \cap B) = 0.09$; $P(A \cap C) = 0.27$; $P(A \cap B \cap C) = 0.08$

$P(A \cup B \cup C) \geq 0.8$

Now every probability is less than equal to 1

$$\therefore \quad 0.8 \leq P(A \cup B \cup C) \leq 1$$

$$\Rightarrow 0.8 \leq P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C) \leq 1$$

$$\Rightarrow 0.8 \leq 0.3 + 0.5 + 0.7 - 0.09 - P(B \cap C) - 0.27 + 0.08 \leq 1$$

$$\Rightarrow 0.8 \leq 1.22 - P(B \cap C) \leq 1$$

$$\Rightarrow 0.8 - 1.22 \leq -P(B \cap C) \leq 1 - 1.22$$

$$\Rightarrow -.42 \leq -P(B \cap C) \leq -.22$$

$\Rightarrow \quad .42 \geq P(B \cap C) \geq .22$ --- {sign changes}

$\Rightarrow \quad .22 \leq P(B \cap C) \leq 0.42$

$\Rightarrow \quad \boxed{P(B \cap C) \in [.22, .42]}$ Ans

Qn. 8 →

$A \rightarrow$ both cards are red

$B \rightarrow$ both cards are queens

$A \cap B \rightarrow$ both are red queens

$$P(A) = \frac{26_{C_2}}{52_{C_2}}$$

$$P(B) = \frac{4_{C_2}}{52_{C_2}}$$

$$P(C) = \frac{2_{C_2}}{52_{C_2}}$$

Required probability $= P(A \cup B)$

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

$$= \frac{26_{C_2}}{52_{C_2}} + \frac{4_{C_2}}{52_{C_2}} - \frac{2_{C_2}}{52_{C_2}}$$

$$= \frac{26_{C_2} + 4_{C_2} - 2_{C_2}}{52_{C_2}}$$

$$= \frac{325 + 6 - 1}{1326}$$ --- $\left\{ {}^nC_2 = \frac{n(n-1)}{2} \right\}$

$= \frac{330}{1326}$

$\Rightarrow \boxed{\text{Req Prob} = \frac{55}{221}}$ Anss

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Qn. 9 →

I II III IV

1 2 3 ------ 12

1^{st} ball can be distributed in any of 4 boxes in 4 ways

for ~~the~~ every ball it is 4 ways

∴ total No. of ways of distributing 12 balls among 4 boxes $= 4 \times 4 \times 4 \times ---- 12$ times

$= 4^{12}$

favour

(i) It is required 3 balls goes to box I

∴ 3 balls from 12 Balls can be selected in $^{12}C_3$ ways

Now remaining 9 balls can be distributed among 3 boxes in $= 3 \times 3 \times 3 \times --$ 9 times

$= 3^9$ ways

∴ favourable ways $= {}^{12}C_3 \times 3^9$

$\therefore$ Required probability = $\frac{\text{favour ways}}{\text{total ways}}$

$$\boxed{\text{Req. prob} = \frac{{}^{12}C_3 \times 3^9}{4^{12}}}$$ Ans

Qn 10 → 3 Red, 4 Black, 3 green
total = 10 balls

3 cases
Case I : 1R, 1B, 2G
Case II : 1R, 2B, 1G
Case III : 2R, 1B, 1G

total No of ways of drawing 4 balls from 10 balls = ${}^{10}C_4$

favour ways: $({}^3C_1 \times {}^4C_1 \times {}^3C_2) + ({}^3C_1 \times {}^4C_2 \times {}^3C_1) + ({}^3C_2 \times {}^4C_1 \times {}^3C_1)$

$= (3 \times 4 \times 3) + (3 \times 6 \times 3) + (3 \times 4 \times 3)$

$= 36 + 54 + 36$

$= 126$

Required prob = $\frac{\text{favour way}}{\text{total way}}$

$= \frac{126}{{}^{10}C_4}$

$= \frac{126}{\frac{10 \times 9 \times 8 \times 7}{24}} = \frac{126 \times 24}{10 \times 9 \times 8 \times 7} = \frac{126}{210} = \frac{21}{35}$ Ans

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