

Ques 1 $S = \{1, 2, 3, \dots, 10\}$

$A \rightarrow$ number is even

$B \rightarrow$ number more than 3

$$A = \{2, 4, 6, 8, 10\}$$

$$B = \{4, 5, 6, 7, 8, 9, 10\}$$

$$A \cap B = \{4, 6, 8, 10\}$$

$$P(A \cap B) = \frac{4}{10} \quad \& \quad P(B) = \frac{7}{10}$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{4/10}{7/10}$$

$$\therefore \boxed{\text{Required prob} = \frac{4}{7}} \quad \underline{\text{Ans}}$$

Ques 2 $\star A \rightarrow$ Number 4 has appeared at least once

$B \rightarrow$ Sum is 6

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

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

$$A \cap B = \{(2, 4) (4, 2)\}$$

$$P(A \cap B) = \frac{2}{36} \quad \& \quad P(B) = \frac{5}{36}$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{2/36}{5/36}$$

$$\therefore \boxed{\text{Required Probability} = \frac{2}{5}} \quad \underline{\text{Ans}}$$

Qus 3 → 1st die is Black
2nd die is Red

(a) $A \rightarrow$ sum more than 9

$B \rightarrow$ Black die shows 5

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

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

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

$$P(A \cap B) = 2/36 \quad \& \quad P(B) = 6/36$$

$$P(A/B) = \frac{2/36}{6/36}$$

$$\boxed{\text{Required prob} = 1/3} \quad \underline{\underline{\text{Ans}}}$$

(b) $A \rightarrow$ getting sum 8

$B \rightarrow$ Red die shows number less than 4

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

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

$$A \cap B = \{ (6,2), (5,3) \}$$

$$P(A \cap B) = 2/36 \quad \& \quad P(B) = 18/36$$

$$\text{Req prob} \quad P(A/B) = \frac{2/36}{18/36}$$

$$\boxed{\text{Req prob} = \frac{1}{9}} \quad \underline{\underline{\text{Ans}}}$$

(3)

Q. 4 \rightarrow $S = \{ BB, BG, GB, GG \}$

(ii) $A \rightarrow$ both are girls

$B \rightarrow$ atleast one is girl

$$A = \{ GG \}$$

$$B = \{ BG, GB, GG \}$$

$$A \cap B = \{ GG \}$$

$$P(A \cap B) = 1/4 \quad \& \quad P(B) = 3/4$$

$$P(A|B) = \frac{1/4}{3/4}$$

Req. prob = $1/3$

Ans

(i) $A \rightarrow$ both are girls

$B \rightarrow$ Youngest is a girl

$$A = \{ GG \}$$

$$B = \{ BG, GG \}$$

$$A \cap B = \{ GG \}$$

$$P(A \cap B) = 1/4 \quad \& \quad P(B) = 2/4$$

$$P(A|B) = \frac{1/4}{2/4}$$

Req prob = $1/2$

Ans

Q. 5 \rightarrow

$A \rightarrow$ the student chosen studies in class XII

$B \rightarrow$ the student chosen is a girl

(9)

$A \cap B \rightarrow$ girl of class #2nd

$$P(A \cap B) = \frac{10\% \text{ of } 430}{1000} = \frac{43}{1000}$$

$$P(B) = \frac{430}{1000}$$

$$P(A|B) = \frac{43/1000}{430/1000} = \frac{1}{10}$$

$$\therefore \boxed{\text{Req. Prob} = \frac{1}{10}} \quad \underline{\text{Ans}}$$

Ques 6 \rightarrow

$A \rightarrow$ the question is easy

$B \rightarrow$ it is MCQ

$A \cap B \rightarrow$ it is an easy MCQ

$$P(A \cap B) = \frac{500}{1000}$$

$$P(B) = \frac{500 + 400}{1400} = \frac{900}{1400}$$

$$P(A|B) = \frac{\frac{500}{1400}}{\frac{900}{1400}} = \frac{5}{9}$$

$$\boxed{\text{Req prob} = \frac{5}{9}} \quad \underline{\text{Ans}}$$

Ques 7 \rightarrow

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

$A \rightarrow$ coins shows tail

$B \rightarrow$ atleast one die shows 3.

$$A = \{ (1, T), (2, T), (4, T), (5, T) \}$$

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

$$A \cap B = \{ \} = \phi$$

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

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{P(B)} = 0$$

∴ Req. prob = 0 Ans

Ques 8 ★ Given $P(A) = \frac{6}{11}$, $P(B) = \frac{5}{11}$, $P(A \cup B) = \frac{7}{11}$

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

$$\frac{7}{11} = \frac{6}{11} + \frac{5}{11} - P(A \cap B)$$

$$\Rightarrow P(A \cap B) = \frac{4}{11}$$

$$(i) P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{4/11}{5/11} = 4/5 \quad \underline{\underline{\text{Ans}}}$$

$$(2) P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{4/11}{6/11} = \frac{2}{3} \quad \underline{\underline{\text{Ans}}}$$

Ques 9 ★ Given $2 P(A) = P(B) = \frac{5}{13}$ & $P(A/B) = \frac{2}{5}$

$$\Rightarrow P(A) = \frac{5}{26} \quad \& \quad P(B) = \frac{5}{13}$$

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

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

$$\Rightarrow \frac{2}{5} \times \frac{5}{13} = P(A \cap B)$$

$$\Rightarrow P(A \cap B) = \frac{2}{13}$$

$$\begin{aligned} \text{Now } P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\ &= \frac{5}{26} + \frac{5}{13} - \frac{2}{13} \\ &= \frac{5 + 10 - 4}{26} \end{aligned}$$

$$\boxed{P(A \cup B) = \frac{11}{26}} \quad \underline{\text{Ans}}$$

Ques 10 →

A → Student Read Hindi Newspaper

B → Student Read English Newspaper

$$\text{Given } P(A) = \frac{60}{100} ; P(B) = \frac{40}{100} \text{ \& } P(A \cap B) = \frac{20}{100}$$

(a) Required prob := $P(A' \cap B')$

$$= 1 - P(A \cup B)$$

$$= 1 - [P(A) + P(B) - P(A \cap B)]$$

$$= 1 - \left[\frac{60}{100} + \frac{40}{100} - \frac{20}{100} \right]$$

$$= 1 - \frac{80}{100} = \frac{20}{100}$$

$$= \frac{1}{5} \quad \underline{\text{Ans}}$$

(b) Required prob = $P(B/A)$

$$= \frac{P(A \cap B)}{P(A)} = \frac{\frac{20}{100}}{\frac{60}{100}} = \frac{20}{60} = \frac{1}{3}$$

$$\therefore \text{Req prob} = \frac{1}{3} \quad \underline{\text{Ans}}$$

$$P(A \cap B) = 1/4$$

$$P(B) = 2/4$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/4}{2/4} = 1/2 \quad \underline{\text{Ans}}$$

Q no 13 *

Given $P(A' \cup B') = 2/3$

$$P(A \cup B) = 5/9$$

Now

$$P(A' \cup B') = P(A \cap B)' \quad \text{--- by De-morgan's law}$$

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

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

also

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

$$\frac{5}{9} = P(A) + P(B) - \frac{1}{3}$$

$$\Rightarrow \frac{5}{9} = 1 - P(A') + 1 - P(B') = \frac{1}{3}$$

$$\Rightarrow P(A') + P(B') = 2 - \frac{1}{3} - \frac{5}{9}$$

$$= \frac{18 - 3 - 5}{9}$$

$$\boxed{P(A') + P(B') = \frac{10}{9}} \quad \underline{\text{Ans}}$$

Ques 14 →Let $A \rightarrow$ sub-system A fails $B \rightarrow$ sub-system B failsGiven

$$P(A) = 0.2$$

$$P(B \cap A') = 0.15$$

$$P(A \cap B) = 0.15$$

we have

$$P(B \cap A') = 0.15$$

$$\Rightarrow P(B) - P(A \cap B) = 0.15$$

$$\Rightarrow P(B) - 0.15 = 0.15$$

$$\Rightarrow P(B) = 0.30$$

$$(i) P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.15}{0.30} = \frac{1}{2} \quad \underline{\underline{Ans}}$$

$$\begin{aligned} (2) P(A \text{ fails alone}) &= P(A \cap B') \\ &= P(A) - P(A \cap B) \\ &= 0.2 - 0.15 \\ &= 0.05 \quad \underline{\underline{Ans}} \end{aligned}$$

Ques 15 →Given

$$P(B) = \frac{3}{5}$$

$$P(A|B) = \frac{1}{2}$$

$$P(A \cup B) = \frac{4}{5}$$

we have $P(A|B) = \frac{P(A \cap B)}{P(B)}$

(10)

$$\Rightarrow P(A \cap B) = P(A|B) P(B)$$

$$= \frac{1}{2} \times \frac{3}{5}$$

$$P(A \cap B) = \frac{3}{10}$$

Now $P(A \cup B)' = 1 - P(A \cup B)$

$$\Rightarrow P(A \cup B)' = 1 - \frac{4}{5}$$

$$\Rightarrow P(A \cup B)' = \frac{1}{5}$$

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

$$= P(A') + P(B) - [P(B) - P(A \cap B)]$$

to find $P(A)$

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

$$\frac{4}{5} = P(A) + \frac{3}{5} - \frac{3}{10}$$

$$P(A) = \frac{4}{5} - \frac{3}{5} + \frac{3}{10} = \frac{8 - 6 + 3}{10} = \frac{5}{10} = \frac{1}{2}$$

$$P(A') = 1 - \frac{1}{2} = \frac{1}{2}$$

$$\therefore P(A' \cup B) = \frac{1}{2} + \frac{3}{5} - \frac{3}{5} + \frac{3}{10} = \frac{5 + 3}{10} = \frac{8}{10} = \frac{4}{5}$$

Now $P(A \cup B)' + P(A' \cup B) = \frac{1}{5} + \frac{4}{5} = 1$

$$\therefore P(A \cup B)' + P(A' \cup B) = 1$$

Ques $\rightarrow P(A) = \frac{7}{13}$; $P(B) = \frac{9}{13}$; $P(A \cup B) = \frac{12}{13}$

$$P(A \cap B) = \frac{7}{13} + \frac{9}{13} - \frac{12}{13} = \frac{4}{13}$$

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

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

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

$$= 1 - \frac{4/13}{9/13}$$

$$= \frac{5}{9}$$