Short Answer Questions (PYQ)

[2 Mark]

Q.1. Prove that if *E* and *F* are independent events, then the events *E* and *F′* are also independent.

Ans.

Since, *E* and *F* are independent events.

⇒ $P(E \cap F) = P(E).\ P(F)$

Now, $P(E \cap F') = P(E).\ P(E \cap F)$

$= P(E) - P(E).\ P(F) = P(E)(1 - P(F))$

⇒ $P(E \cap F') = P(E).\ P(F')$

Hence, *E* and *F′* are independent events.

Q.2. If $P(A) = 0.4$, $P(B) = p$, $P(A \cup B) = 0.6$ and *A* and *B* are given to be independent events, find the value of '*p*'.

Ans.

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

⇒ $0.6 = 0.4 + p - P(A \cap B)$

⇒ $P(A \cap B) = 0.4 + p - 0.6 = p - 0.2$

Since, *A* and *B* are independent events.

∴ $P(A \cap B) = P(A) \times P(B)$

⇒ $p - 0.2 = 0.4 \times p$

⇒ $p - 0.4\,p = 0.2$

⇒ $0.6\,p = 0.2$

⇒ $p = \frac{0.2}{0.6} = \frac{1}{3}$

Q.3. From a set of 100 cards numbered 1 to 100, one card is drawn at random. Find the probability that the number on the card is divisible by 6 or 8, but not by 24.

Ans.

Number divisible by 6 from 1 to 100 = 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96

Number divisible by 8 from 1 to 100 = 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96

$\therefore$ Number divisible by 6 or 8 but not by 24 from 1 to 100 = 6, 8, 12, 16, 18, 30, 32, 36, 40, 42, 54, 56, 60, 64, 66, 78, 80, 84, 88, 90.

$\therefore$ Required probability $= \frac{20}{100} = \frac{1}{5}$

Short Answer Questions (OIQ)

[2 Mark]

Q.1. **Given that** $P(\bar{A}) = 0.4, P(B) = 0.2$ **and** $P\left(\frac{A}{B}\right) = 0.5$. **Find** $\boldsymbol{P(A \cup B)}$.

Ans.

$P(\bar{A}) = 0.4$

$\Rightarrow \quad P(A) = 1 - 0.4 = 0.6$

Now, $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$\Rightarrow \quad 0.5 = \frac{P(A \cap B)}{0.2}$

$\Rightarrow \quad P(A \cap B) = 0.5 \times 0.2 = 0.1$

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

$= 0.6 + 0.2 - 0.1 = 0.8 - 0.1$

$= 0.7$

Q.2. 10% of the bulbs produced in a factory are of red colour and 2% are red and defective. If one bulb is picked up at random, determine the probability of its being defective if it is red.

Ans.

Let A and B be two events such that.

A = produced bulb is red

B = produced bulb is defective

Given, $P(A) = \frac{10}{100} = \frac{1}{10}$ $\qquad P(A \cap B) = \frac{2}{100} = \frac{1}{50}$

$P(B / A)$ is required.

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

$= \frac{1/50}{1/10} \qquad = \frac{1}{50} \times \frac{10}{1} = \frac{1}{5}$

Q.3. Two dice are thrown together. Let *A* be the event 'getting 6 on the first die' and *B* be the event 'getting 2 on the second die'. Are the events *A* and *B* independent?

Ans.

According to question

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

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

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

Now, $P(A) = \frac{6}{36} = \frac{1}{6}$ $\qquad P(B) = \frac{6}{36} = \frac{1}{6}$

$P(A \cap B) = \frac{1}{36}$

We have, $P(A).P(B) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$= P(A \cap B)$

$\Rightarrow$ A and B are independent events.

Q.4. Let *A* and *B* be two events. If *P*(*A*) = 0.2, *P*(*B*) = 0.4, *P*(*A* ∪ *B*) = 0.6 then find *P*(*A* / *B*).

Ans.

We have

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

$$0.6 = 0.2 + 0.4 - P(A \cap B)$$

$$\Rightarrow \quad 0.6 = 0.6 - P(A \cap B)$$

$$\Rightarrow \quad P(A \cap B) = 0.6 - 0.6 = 0$$

Now, $P\,(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{0.4} = 0$

Q.5. Let *A* and *B* be two events such that *P*(*A*) = 0.6, *P*(*B*) = 0.2 and *P*(*A* / *B*) = 0.5. Then find *P*(*A′*/*B′*).

Ans.

We have

$$P\,(A/B) = \frac{P(A \cap B)}{P(B)} \quad \Rightarrow \quad 0.5 = \frac{P\,(A \cap B)}{0.2}$$

$$\Rightarrow \quad P(A \cap B) = 0.5 \times 0.2 = 0.1$$

$$\Rightarrow \quad P(A \cap B)' = 1 - 0.1 = 0.9$$

$$\Rightarrow \quad P(A' \cup B') = 0.9$$

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

$$\Rightarrow \quad 0.9 = 0.4 + 0.8 - P(A' \cap B') \quad \begin{bmatrix} P(A') = 1 - P(A) = 1 - 0.6 = 0.4 \\ P(B') = 1 - P(B) = 1 - 0.2 = 0.8 \end{bmatrix}$$

$$\Rightarrow \quad P(A' \cup B') = 1.2 - 0.9 = 0.3$$

$$\therefore \quad P\,(A'/B') = \frac{P\,(A' \cap B')}{P\,(B')} = \frac{0.3}{0.8} = \frac{3}{8}$$