

7 If A and B are two events such that

$$P(A) = \frac{1}{2}, P(B) = \frac{1}{3} \text{ and } P(A \cap B) = \frac{1}{4}, \text{ then find}$$

(i) $P(A/B)$.

(ii) $P(B/A)$.

(iii) $P(A'/B)$.

(iv) $P(A'/B')$.

Here, $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$

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

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

(iii) $P(A'/B) = 1 - P(A/B) = 1 - \frac{3}{4} = \frac{1}{4}$

or $P(A'/B) = \frac{P(A' \cap B)}{P(B)} = \frac{P(B) - P(A \cap B)}{P(B)} = \frac{\frac{1}{3} - \frac{1}{4}}{\frac{1}{3}} = \frac{\frac{1}{12}}{\frac{1}{3}} = \frac{1}{4}$

(iv) $P(A'/B') = \frac{P(A' \cap B')}{P(B')} = \frac{1 - P(A \cup B)}{1 - P(B)} = \frac{1 - [P(A) + P(B) - P(A \cap B)]}{1 - P(B)}$

$$= \frac{1 - \left[\frac{1}{2} + \frac{1}{3} - \frac{1}{4} \right]}{1 - \frac{1}{3}} = \frac{1 - \left(\frac{5}{6} - \frac{1}{4} \right)}{\frac{2}{3}}$$

$$= \frac{1 - 14/24}{2/3} = \frac{10/24}{2/3} = \frac{30}{48} = \frac{5}{8}$$