

AI5002: Assignment 4

Pradyumn Sharma
AI21MTECH02001

latex codes from

<https://github.com/96143/Assignment-4/blob/main/assignment%204.tex>

1 PROBLEM

If (A) and (B) are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(AB) = \frac{1}{8}$, Find $P(\text{not } A \text{ and not } B)$.

2 SOLUTION

Given-

$$\begin{aligned} \Pr(A) &= \frac{1}{4} \\ \Pr(B) &= \frac{1}{2} \\ \Pr(AB) &= \frac{1}{8} \end{aligned} \quad (2.0.1)$$

To find - $P(\text{not } A \text{ and not } B) = P(A'B')$

Using De-Morgan's Law

$$\Pr(A'B') = \Pr(A + B)' \quad (2.0.2)$$

Also,

$$\Pr(A + B)' = 1 - \Pr(AB) \quad (2.0.3)$$

Using the axiom of Probability

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \quad (2.0.4)$$

Using (2.0.1) in (2.0.4)

$$\Pr(A + B) = \frac{1}{4} + \frac{1}{2} - \frac{1}{8} = \frac{5}{8} \quad (2.0.5)$$

Using (2.0.5) in (2.0.3)

$$\begin{aligned} \Pr(A + B)' &= 1 - \frac{5}{8} \\ \Pr(A + B)' &= \frac{3}{8} \end{aligned} \quad (2.0.6)$$

Hence,

$$\Pr(A'B') = \frac{3}{8}$$