## Assignment

## Dhruv Parashar-EE22BTECH11019

Question:- Let A and B be two events such that  $Pr(A) = \frac{3}{8}$ ,  $Pr(B) = \frac{5}{8}$  and  $Pr(A + B) = \frac{3}{4}$ . Then  $Pr(A|B) \cdot Pr(A'|B)$  is equal to

- (a)  $\frac{2}{5}$
- (b)  $\frac{3}{8}$
- (c)  $\frac{3}{20}$
- (d)  $\frac{6}{25}$

Solution: Given

$$\Pr(A) = \frac{3}{8} \tag{1}$$

$$\Pr(B) = \frac{5}{8} \tag{2}$$

$$Pr(A) = \frac{3}{8}$$
 (1)  
 $Pr(B) = \frac{5}{8}$  (2)  
 $Pr(A + B) = \frac{3}{4}$  (3)

As we know

$$Pr(A + B) = Pr(A) + Pr(B) - Pr(AB)$$
 (4)

$$\implies \Pr(AB) = \Pr(A) + \Pr(B) - \Pr(A+B) \tag{5}$$

$$\implies \Pr(AB) = \frac{1}{4} \tag{6}$$

Now,

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \tag{7}$$

$$Pr(A|B) = \frac{Pr(AB)}{Pr(B)}$$

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

$$= \frac{Pr(B) - Pr(AB)}{Pr(B)}$$
(9)

$$= \frac{\Pr(B) - \Pr(AB)}{\Pr(B)} \tag{9}$$

From (7) and (9)

$$Pr(A|B).Pr(A'|B) = \frac{Pr(AB)}{Pr(B)} \times \frac{Pr(B) - Pr(AB)}{Pr(B)}$$
(10)

$$=\frac{\left(\frac{1}{4}\right)}{\frac{5}{8}} \times \frac{\left(\frac{5}{8} - \frac{1}{4}\right)}{\frac{5}{8}} \tag{11}$$

$$=\frac{6}{25}\tag{12}$$