

ASSIGNMENT-1 PROBABILITY

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Question 12.13.3.65

You are given that A and B are two events such that $\Pr(B) = \frac{3}{5}$, $\Pr(A|B) = \frac{1}{2}$, $\Pr(A+B) = \frac{4}{5}$ and $\Pr(A) = \frac{1}{2}$. $\Pr(B|A')$ is equal to

Solution: You are given that events A and B have the following probabilities:

$$\Pr(B) = \frac{3}{5} \quad (1)$$

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

$$\Pr(A) = \frac{1}{2} \quad (3)$$

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

$$= \frac{1}{2} + \frac{3}{5} - \frac{4}{5} \quad (5)$$

$$= \frac{3}{10} \quad (6)$$

We know that,

$$A + A' = 1 \quad (7)$$

$$AA' = 0 \quad (8)$$

We can write $\Pr(B)$ as:

$$\Pr(B) = \Pr(B(A+A')) \quad (9)$$

$$= \Pr(BA + BA') \quad (10)$$

By inclusion-exclusion principle,

$$\Pr(B) = \Pr(BA) + \Pr(BA') + \Pr((BA)(BA')) \quad (11)$$

$$= \Pr(BA) + \Pr(BA') + \Pr((BB)(AA')) \quad (12)$$

$$= \Pr(BA) + \Pr(BA') \quad (13)$$

$$\Rightarrow \Pr(BA') = \Pr(B) - \Pr(BA) \quad (14)$$

$$= \frac{3}{5} - \frac{3}{10} \quad (15)$$

$$= \frac{3}{10} \quad (16)$$

$$\Pr(B|A') = \frac{\Pr(A'B)}{\Pr(A')} \quad (17)$$

$$= \frac{\frac{3}{10}}{\frac{1}{2}} \quad (18)$$

$$= \frac{3}{5} \quad (19)$$