

Assignment

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Question 12.13.3.60

If A and B are two events such that $\Pr(A) = \frac{1}{2}$, $\Pr(B) = \frac{1}{3}$, $\Pr(A|B) = \frac{1}{4}$, Then $\Pr(A' B')$ equals

- 1) $\frac{1}{12}$
- 2) $\frac{3}{4}$
- 3) $\frac{1}{4}$
- 4) $\frac{3}{16}$

Solution:

from De Morgan's Law

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

$$1 - \Pr(A + B) = \Pr(A' B') \quad (2)$$

So,

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \quad (3)$$

Finding $\Pr(AB)$ by,

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \quad (4)$$

$$(5)$$

by substituting the values $\Pr(B) = \frac{1}{3}$ and $\Pr(A|B) = \frac{1}{4}$

$$\Pr(AB) = \frac{1}{12} \quad (6)$$

$$\Pr(A + B) = \frac{1}{2} + \frac{1}{3} - \frac{1}{12} \quad (7)$$

$$= \frac{3}{4} \quad (8)$$

Then,

$$\Pr(A' B') = 1 - \Pr(A + B) \quad (9)$$

$$= 1 - \frac{3}{4} \quad (10)$$

$$= \frac{1}{4} \quad (11)$$