Assignment 1

AI1110 : Probability and Random Varriables
Indian Institute of Technology Hyderabad

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Problem 11.16.4.7 : A and B are two events such that $\Pr(A) = 0.54$, $\Pr(B) = 0.69$ and $\Pr(AB) = 0.35$. Find

1) $\Pr(A + B)$
2) $\Pr(A'B')$
3) $\Pr(AB')$
4) $\Pr(BA')$.

Solution:
Given,

$$\Pr(A) = 0.54 \tag{1}$$
$$\Pr(B) = 0.69 \tag{2}$$
$$\Pr(AB) = 0.35 \tag{3}$$

Let,

$$X = \begin{cases} 1, & \text{Event } A \text{ occurs} \\ 0, & \text{Event } A \text{ not occurs} \end{cases} \tag{4}$$

$$Y = \begin{cases} 1, & \text{Event } B \text{ occurs} \\ 0, & \text{Event } B \text{ not occurs} \end{cases} \tag{5}$$

So,

$$\Pr(X = 1) = 0.54 \tag{6}$$
$$\Pr(Y = 1) = 0.69 \tag{7}$$
$$\Pr(X = 1, Y = 1) = 0.35 \tag{8}$$

$X \downarrow Y \rightarrow$	1	0
1	$\Pr(X = 1, Y = 1)$	$\Pr(X = 1, Y = 0)$
0	$\Pr(X = 0, Y = 1)$	$\Pr(X = 0, Y = 0)$

1)

$$\Pr(A + B) = \Pr(X = 1 \text{ or } Y = 1) \tag{9}$$
$$= \Pr(X = 1) + \Pr(Y = 1) - \Pr(X = 1, Y = 1) \tag{10}$$
$$= 0.54 + 0.69 - 0.35 \tag{11}$$
$$= 0.88 \tag{12}$$

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2)

$$\begin{aligned}
\Pr(A'B') &= \Pr(X = 0, Y = 0) && (13)\\
&= 1 - \Pr(X = 1 \text{ or } Y = 1) && (14)\\
&= 1 - 0.88 && (15)\\
&= 0.12 && (16)
\end{aligned}$$

3)

$$\begin{aligned}
\Pr(AB') &= \Pr(X = 1, Y = 0) && (17)\\
&= \Pr(X = 1) - \Pr(X = 1, Y = 1) && (18)\\
&= 0.54 - 0.35 && (19)\\
&= 0.19 && (20)
\end{aligned}$$

4)

$$\begin{aligned}
\Pr(BA') &= \Pr(X = 0, Y = 1) && (21)\\
&= \Pr(Y = 1) - \Pr(X = 1, Y = 1) && (22)\\
&= 0.69 - 0.35 && (23)\\
&= 0.34. && (24)
\end{aligned}$$