# 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,

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

1) We know that,

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{4}$$
$$\implies \Pr(A + B) = 0.54 + 0.69 - 0.35 \tag{5}$$
$$= 0.88. \tag{6}$$

2) By **De Morgan's law**,

$$A'B' = (A + B)' \tag{7}$$
$$\implies \Pr(A'B') = \Pr\left((A + B)'\right) \tag{8}$$
$$= 1 - \Pr(A + B) \tag{9}$$
$$= 1 - 0.88 \tag{10}$$
$$= 0.12 \tag{11}$$

3) We know that,

$$A = AB + AB' \tag{12}$$
$$\implies \Pr(A) = \Pr(AB) + \Pr\left(AB'\right) - \Pr\left((AB)(AB')\right) \tag{13}$$

As $AB$ and $AB'$ mutually exclusive,

$$\therefore \Pr\left((AB)(AB')\right) = 0 \tag{14}$$
$$\implies \Pr\left(AB'\right) = \Pr(A) - \Pr(AB) \tag{15}$$
$$= 0.54 - 0.35 \tag{16}$$
$$= 0.19 \tag{17}$$

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4) We know that,

$$\Pr\left(BA'\right) = \Pr\left(B\right) - \Pr\left(AB\right) \tag{18}$$
$$\implies \Pr\left(BA'\right) = 0.69 - 0.35 \tag{19}$$
$$= 0.34. \tag{20}$$