ASSIGNEMNT-1 PROBABILITY

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Question 12.13.3.9

$Let E_1$ and E_2 be two independent events such that $\Pr(E_1) = p_1$ and $\Pr(E_2) = p_2$ Describe in words the events whose probabilities are :

i) $p_1 p_2$ (ii) $(1 - p_1)p_2$ (iii) $1 - (1 - p_1)(1 - p_2)$ (iv) $p_1 + p_2 - 2p_1 p_2$

Solution:

$$\Pr(E1) = p_1 \quad \Pr(E_2) = p_2 \tag{1}$$

$$(i)\, p_1 p_2 = \Pr(E_1)\Pr(E_2) \tag{2}$$

$$= \Pr(E_1 E_2) \tag{3}$$

So, E_1 and E_2 occur simultaneously.

$$(ii)(1 - p_1)(p_2) = \Pr\left(\overline{E_1}\right)\Pr(E_2) \tag{4}$$

$$= \Pr\left(\overline{E_1}E_2\right) \tag{5}$$

So, E_1 does not occur but E_2 occurs.

$$(iii)1 - (1 - p_1)(1 - p_2) = 1 - \Pr\left(\overline{E_1}\right)\Pr\left(\overline{E_2}\right) \tag{6}$$

$$= 1 - \Pr\left(\overline{E_1}\ \overline{E_2}\right) \tag{7}$$

$$= \Pr(E_1 + E_2) \tag{8}$$

So, either E_1 or E_2 or both E_1 and E_2 occurs.

$$(iv)p_1 + p_2 - 2p_1 p_2 = \Pr(E_1) + \Pr(E_2) - 2\Pr(E_1)\Pr(E_2) \tag{9}$$

$$= \Pr(E_1) + \Pr(E_2) - 2\Pr(E_1 E_2) \tag{10}$$

$$= \Pr(E_1 + E_2) - \Pr(E_1 E_2) \tag{11}$$

So, either E_1 or E_2 occurs but not both