Question 12.13.3.18

EE22BTECH11051

Question: A box has 5 blue and 4 red balls. One ball is drawn at random and not replaced. Its colour is also not noted. Then another ball is drawn at random. What is the probability of second ball being blue?

Solution:

Let X and Y denote the random variables for the first and second draw respectively as follows:

RV	Values	Description
X	$\{0,1\}$	1st draw :- 0: blue, 1: red
Y	$\{0,1\}$	2nd draw :- 0: blue, 1: red

TABLE I
RANDOM VARIABLES

The probabilities are given as:

$$\Pr(X=0) = \frac{5}{9} \tag{1}$$

$$\Pr(X=1) = \frac{4}{9} \tag{2}$$

$$\Pr(Y=0|X=0) = \frac{\Pr((Y=0)(X=0))}{\Pr(X=0)} = \frac{1}{2} \tag{3}$$

$$\Pr(Y=0|X=1) = \frac{\Pr((Y=0)(X=1))}{\Pr(X=1)} = \frac{5}{8} \tag{4}$$

The probability of the second ball beign drawn being blue is given as:

$$\Pr(Y=0) = \Pr(X=0)\Pr(Y=0|X=0) + \Pr(X=1)\Pr(Y=0|X=1) \tag{5}$$

$$= \frac{5}{9}\times\frac{1}{2} + \frac{4}{9}\times\frac{5}{8} \tag{6}$$

$$= \frac{5}{9} \tag{7}$$