12.13.1.41

EE22BTECH11010 - Aryan Bubna

question: Three bags contains a no of red and white balls as follows:

B_1: 3 red balls,B_2:2 red balls and 1 white ball,B_3:3 white balls

The probability that bag i will be chosen and a ball is selected is i/6,i=1,2,3.

what is the probability that

(i) a red ball will be selected?

(ii) a white ball will be selected?

Solution:

object	RV	values	description
bag	X	1	bag-1 is selected
		2	bag-2 is selected
		3	bag-3 isselected
ball	Y	0	white ball is selected
		1	red ball is selected

TABLE 0: random variables of objects

$$\Pr(X=i) = \begin{cases} \frac{1}{6}, \text{when i=1} \\ \frac{2}{6}, \text{when i=2} \\ \frac{3}{6}, \text{when i=3} \end{cases} \tag{1}$$

we know that that the conditional probability is defined as $\Pr(A|B) = \frac{\Pr(A,B)}{\Pr(B)}$

1) The probability that a red ball will be selected is:

$$\Pr(Y=1) = \Pr(Y=1, X=1) + \Pr(Y=1, X=2) + \Pr(Y=1, X=3) \tag{2}$$

$$= \Pr(X=1)\times\Pr(Y=1|X=1) + \Pr(X=2)\times\Pr(Y=1|X=2) + \Pr(X=3)\times\Pr(Y=1|X=3) \tag{3}$$

$$= \frac{1}{6}\times\frac{3}{3} + \frac{2}{6}\times\frac{2}{3} + \frac{3}{6}\times 0 \tag{4}$$

$$= \frac{7}{18} \tag{5}$$

2) The probability that a white ball will be selected is:

$$\Pr(Y=0) = \Pr(Y=0, X=1) + \Pr(Y=0, X=2) + \Pr(Y=0, X=3) \tag{6}$$

$$= \Pr(X=1)\times\Pr(Y=0|X=1) + \Pr(X=2)\times\Pr(Y=0|X=2) + \Pr(X=3)\times\Pr(Y=0|X=3) \tag{7}$$

$$= \frac{1}{6}\times 0 + \frac{2}{6}\times\frac{1}{3} + \frac{3}{6}\times\frac{3}{3} \tag{8}$$

$$= \frac{11}{18} \tag{9}$$