

# 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 is selected
ball	Y	0	white ball is selected
		1	red ball is selected

TABLE 0: random variables of objects

$$\Pr(X = 1) = \frac{1}{6} \quad (1)$$

$$\Pr(X = 2) = \frac{2}{6} \quad (2)$$

$$\Pr(X = 3) = \frac{3}{6} \quad (3)$$

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:

$$\Pr(Y = 1) = \Pr(Y = 1, X = 1) + \Pr(Y = 1|X = 2) + \Pr(Y = 1|X = 3)$$

(4)

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

(5)

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

(6)

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

(7)

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

$$\Pr(Y = 0) = \Pr(Y = 0, X = 1) + \Pr(Y = 0|X = 2) + \Pr(Y = 0|X = 3)$$

(8)

$$= \Pr(X = 1) \times \Pr(Y = 0|X = 1) + \Pr(X = 2) \times \Pr(Y = 0|X = 2) + \Pr(X = 3) \times \Pr(Y = 0|X = 3)$$

(9)

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

(10)

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

(11)