

# Assignment

Aryan Jain - EE22BTECH11011\*

**Question:** There are two bags, one which contains 3 black balls and 4 white balls while the other contains 4 black balls and 3 white balls. A die is thrown. If it shows up 1 or 3, a ball is taken from the first bag; but if shown up any other number, a ball is taken from the second bag. Find the probability of choosing a black ball.

**Solution:**

So we already know,

RV	Value	Description
$X_i$	1	first bag is selected
	2	second bag is selected
$Y_i$	1	black ball is drawn
	2	white ball is drawn

TABLE 0

RV DESCRIPTION TABLE

$$\Pr(\text{choosing ball from bag 1}) = \Pr(\text{getting 1 or 3 on the die}) \quad (1)$$

$$= \Pr(X_1) \quad (2)$$

$$= \frac{1}{3} \quad (3)$$

$$\Pr(\text{choosing ball from bag 2}) = \Pr(\text{getting any other number on the die}) \quad (4)$$

$$= \Pr(X_2) \quad (5)$$

$$= \frac{2}{3} \quad (6)$$

$$\Pr(\text{choosing black ball from bag 1}) = \Pr(Y_1|X_1) \quad (7)$$

$$= \frac{3}{7} \quad (8)$$

$$\Pr(\text{choosing black ball from bag 2}) = \Pr(Y_1|X_2) \quad (9)$$

$$= \frac{4}{7} \quad (10)$$

So the required probability will be:

$$\Pr(\text{getting a black ball}) = \Pr(X_1) \times \Pr(Y_1|X_1) + \Pr(X_2) \times \Pr(Y_1|X_2) \quad (11)$$

$$= \frac{1}{3} \times \frac{3}{7} + \frac{2}{3} \times \frac{4}{7} \quad (12)$$

$$= \frac{7}{21} \quad (13)$$

Hence, the probability of getting a black ball is  $\frac{7}{21}$ .