# Assignment

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**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 it 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 | 0 | first bag is selected |
| | 1 | second bag is selected |
| Y | 0 | black ball is drawn |
| | 1 | white ball is drawn |

TABLE 0
RV DESCRIPTION TABLE

$$\Pr(\text{choosing ball from bag 1}) = \Pr(\text{getting 1 or 3 on the die}) \tag{1}$$
$$= \Pr(X = 0) \tag{2}$$
$$= \frac{1}{3} \tag{3}$$
$$\Pr(\text{choosing ball from bag 2}) = \Pr(\text{getting any other number on the die}) \tag{4}$$
$$= \Pr(X = 1) \tag{5}$$
$$= \frac{2}{3} \tag{6}$$
$$\Pr(\text{choosing black ball from bag 1}) = \Pr(Y = 0 | X = 0) \tag{7}$$
$$= \frac{3}{7} \tag{8}$$
$$\Pr(\text{choosing black ball from bag 2}) = \Pr(Y = 0 | X = 1) \tag{9}$$
$$= \frac{4}{7} \tag{10}$$

So the required probability will be:

$$\Pr(\text{getting a black ball}) = \Pr(X = 0) \times \Pr(Y = 0 | X = 0) + \Pr(X = 1) \times \Pr(Y = 0 | X = 1) \tag{11}$$
$$= \frac{1}{3} \times \frac{3}{7} + \frac{2}{3} \times \frac{4}{7} \tag{12}$$
$$= \frac{7}{21} \tag{13}$$

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