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
Z	0	1 or 3 is shown up
	1	another number is shown up

TABLE 0
RV DESCRIPTION TABLE

$$\Pr(X=0) = \Pr(Z=0) \tag{1}$$
$$= \frac{1}{3} \tag{2}$$
$$\Pr(X=1) = \Pr(Z=1) \tag{3}$$
$$= \frac{2}{3} \tag{4}$$
$$\Pr(Y=0|X=0) = \frac{3}{7} \tag{5}$$
$$\Pr(Y=0|X=1) = \frac{4}{7} \tag{6}$$

So the required probability will be:

$$\Pr(\text{getting a black ball}) = \Pr(X=0)\times\Pr(Y=0|X=0) + \Pr(X=1)\times\Pr(Y=0|X=1) \tag{7}$$
$$= \frac{1}{3}\times\frac{3}{7} + \frac{2}{3}\times\frac{4}{7} \tag{8}$$
$$= \frac{7}{21} \tag{9}$$

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