

Assignment 2

AI1110:Probability And Random Variables

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i10.15.2.4: A box contains 12 balls out of which x are black. If one ball is drawn at random from the box, what is the probability that it will be a black ball? If 6 more black balls are put in the box, the probability of drawing a black ball is now double of what it was before. Find x .

Solution:

Let X_1 be a random variable that take values 0 and 1 before 6 more black ball added.

Let X_2 be a random variable that take values 0 and 1 after 6 more black ball added.

According to the Question,

$$\Pr(X_2 = 1) = 2(\Pr(X_1 = 1)) \quad (5)$$

$$\frac{x+6}{18} = 2\left(\frac{x}{12}\right) \quad (6)$$

$$\frac{x+6}{18} = \frac{x}{6} \quad (7)$$

$$6(x+6) = 18x \quad (8)$$

$$6x + 36 = 18x \quad (9)$$

$$36 = 12x \quad (10)$$

$$x = 3 \quad (11)$$

\therefore The value of x is 3.

Random Variable	Value	Description
X_1	1	Selected ball is black
	0	otherwise
X_2	1	Selected ball is a black
	0	otherwise

TABLE 0

RANDOM VARIABLE DESCRIPTION

Now

$$\Pr(X_1 = 1) = \frac{\text{Total black balls}}{\text{Total balls}} \quad (1)$$

$$= \frac{x}{12} \quad (2)$$

$$\Pr(X_2 = 1) = \frac{\text{Total black balls}}{\text{Total balls}} \quad (3)$$

$$= \frac{x+6}{18} \quad (4)$$