Assignment 2

AI1110:Probability And Random Variables

Indian Institute of Technology, Hyderabad

RAJIV CHAUDHARY
AI22BTECH11021

10.15.2.4: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 balladded.

$$X_1 = \begin{cases} 1, & \text{Selected ball is black} \\ 0, & \text{Selected ball is not black} \end{cases} \tag{1}$$

$$\Pr(X_1 = 1) = \frac{\text{Total black balls}}{\text{Total balls}} \tag{2}$$

$$= \frac{x}{12} \tag{3}$$

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

$$X_2 = \begin{cases} 1, & \text{Selected ball is black} \\ 0, & \text{Selected ball is not black} \end{cases} \tag{4}$$

$$\Pr(X_2 = 1) = \frac{\text{Total black balls}}{\text{Total balls}} \tag{5}$$

$$= \frac{x+6}{18} \tag{6}$$

According to the Question,

$$\Pr(X_2 = 1) = 2(\Pr(X_1 = 1)) \tag{7}$$

$$\frac{x+6}{18} = 2\left(\frac{x}{12}\right) \tag{8}$$

$$\frac{x+6}{18} = \frac{x}{6} \tag{9}$$

$$6(x+6) = 18x \tag{10}$$

$$6x + 36 = 18x \tag{11}$$

$$36 = 12x \tag{12}$$

$$x = 3 \tag{13}$$

$\therefore$ **The value of x is 3.**