Assignment 2

AI1110:Probability And Random Variables

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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:

Before 6 more Black balls added

Let X be a random variable that take value 0 and 1.

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

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

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

After 6 more Black balls added

Let Y be a random variable that take value 0 and 1.

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

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

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

According to the Question,

$$\Pr(Y = 1) = 2(\Pr(X = 1)) \tag{7}$$

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

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

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

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

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

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

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