

Assignment 2

AI1110 : Probability and Random Variables

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Question: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:

TABLE I
RANDOM VARIABLE DECLARATION
 X_1 :BEFORE ADDITION OF 6 BLACK BALLS
 X_2 :BEFORE ADDITION OF 6 BLACK BALLS

Random Variable	Sample space	Value	Event	Probability
X_1	12	0	not choosing black ball	$12-x/12$
		1	choosing black ball	$x/12$
X_2	18	0	not choosing black ball	$12-x/18$
		1	choosing black ball	$x+6/18$

The probability drawn ball is black is $\Pr(X_1 = 1)$, which is $\frac{x}{12}$.

Given,

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

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

$$x+6 = 3x \quad (3)$$

$$x = 3 \quad (4)$$

Therefore, the value of x is 3.