

Assignment 3

AI1110 Probability and Random Variables

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Question 12.13.4.2: An urn contains 5 red and 2 black balls. Two balls are randomly drawn. Let X represent the number of black balls. What are the possible values of X ? Is X a random variable ?

Solution:

E be the experiment of randomly choosing two balls.

The sample space of the E is $\{RR, RB, BR, BB\}$.

Table 0
DESCRIPTION OF RANDOM VARIABLE X

Random Variable	Description	Outcome of E	Value
X	Number of black balls drawn	RR	0
		RB or BR	1
		BB	2

X is a number whose values are defined on the outcomes of a random experiment. Therefore, X is a random variable.

The distribution of X is

$$\Pr(X = 0) = \frac{{}^2C_0({}^5C_2)}{{}^7C_2} = \frac{10}{21} \quad (1)$$

$$\Pr(X = 1) = \frac{{}^2C_1({}^5C_1)}{{}^7C_2} = \frac{10}{21} \quad (2)$$

$$\Pr(X = 2) = \frac{{}^2C_2({}^5C_0)}{{}^7C_2} = \frac{1}{21} \quad (3)$$

$$\Pr(X = 0) + \Pr(X = 1) + \Pr(X = 2) = 1 \quad (4)$$

Therefore $X = \{0, 1, 2\}$