ASSIGNMENT 8 : PAPOULLIS CHAPTER : 3 EXAMPLE - 3-3

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Outline

Question

A box B1 contains 10 white and 5 red balls and a box B2 contains 20 white and 20 red balls. A ball is drawn from each box. What is the probability that the ball from B1 will be white and the ball from B2 red?

Solution

Let $X = \{0, 1\}$ be a random variable representing the box from which ball is drawn.
Let $Y = \{0, 1\}$ be a random variable representing the colour of the ball.

Event	Description
$X = 0$	ball is drawn from B1
$X = 1$	ball is drawn from B2
$Y = 0$	colour of the ball drawn is white
$Y = 1$	colour of the ball drawn is red

Table 1: Random Variables

1. Probability that the ball from B1 will be white :

$$\Pr\{(X=0)(Y=0)\} = \frac{10}{15} \tag{1}$$

$$= \frac{2}{3} \tag{2}$$

2. Probability that the ball from B2 will be red :

$$\Pr\{(X=1)(Y=1)\} = \frac{20}{40} \tag{3}$$

$$= \frac{1}{2} \tag{4}$$

3. Probability that the ball from B1 will be white and the ball from B2 red is

$$\Pr\{[(X=0)(Y=0)][(X=1)(Y=1)]\} \tag{5}$$

Clearly, the events of drawing a ball from each box are independent i.e.,

$$\Rightarrow \Pr\{(X=0)(Y=0)\}\Pr\{(X=1)(Y=1)\} = \frac{2}{3}\times\frac{1}{2} \tag{6}$$

$$= \frac{1}{3} \tag{7}$$

$\therefore$ Probability that the ball drawn from B1 is white and B2 is red is

$$\Pr\{[(X=0)(Y=0)]\,[(X=1)(Y=1)]\} = \frac{1}{3}. \tag{8}$$