Assignment 7

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***Abstract*—This document contains the solution for Assignment 7 (NCERT Class 12 Chapter 13 Example 8)**

13 E8 [NCERT 12] : An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?

Solution: Let the random variable X_1 map to 0 when the first ball drawn is black, and map to 1 when the first ball is white. Let X_2 be defined analogously. The random variables are given in Table I:

Variable	Event
$X_1 = 0$	1^{st} ball is black
$X_1 = 1$	1^{st} ball is white
$X_2 = 0$	2^{nd} ball is black
$X_2 = 1$	2^{nd} ball is white

TABLE I

The probability we are required to find is $\Pr(X_1 = 0, X_2 = 0)$. Various values of probability are displayed in Table II:

Probability	Value
$\Pr(X_1 = 0)$	$\frac{10}{15} = \frac{2}{3}$
$\Pr(X_2 = 0 \vert X_1 = 0)$	$\frac{9}{14}$
$\Pr(X_2 = 0, X_1 = 0)$	?

TABLE II

Using the multiplication rule of probability, it follows that:

$$\Pr(X_2 = 0, X_1 = 0) = \Pr(X_1 = 0) \times \Pr(X_2 = 0 \vert X_1 = 0) \quad (1)$$

Substituting the values, we get:

$$\Pr(X_2 = 0, X_1 = 0) = \frac{2}{3} \times \frac{9}{14} = \frac{3}{7} \quad (2)$$