

Assignment 3

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Abstract—This document contains the solution for Assignment 3 (CBSE Class 12 Probability Ex 13.3 Q(9))

Question 9 Two groups are competing for the position on the Board of directors of a corporation. The probabilities that the first and the second groups will win are 0.6 and 0.4 respectively. Further, if the first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the second group wins. Find the probability that the new product introduced was by the second group.

Solution.

Let random variables $X, Y \in \{0, 1\}$ denote the following events in Table (I)

Event	Description
$X = 0$	First Group Wins
$X = 1$	Second group wins
$Y = 0$	Group Introduces New Product

TABLE I
DESCRIPTION OF EVENTS

Probability	Value
$\Pr(X = 0)$	0.6
$\Pr(X = 1)$	0.4
$\Pr(Y = 0 X = 0)$	0.7
$\Pr(Y = 0 X = 1)$	0.3
$\Pr(X = 1 Y = 0)$?

TABLE II
INPUT PROBABILITIES

The desired probability is given by:

$$\Pr(X = 1|Y = 0) \quad (1)$$

$$= \frac{\Pr(Y = 0, X = 1)}{\Pr(Y = 0)} \quad (2)$$

$$= \frac{\Pr(Y = 0|X = 1) \Pr(X = 1)}{\sum_{i=0}^1 \Pr(X = i, Y = 0)} \quad (3)$$

$$= \frac{\Pr(Y = 0|X = 1) \Pr(X = 1)}{\sum_{i=0}^1 \Pr(Y = 0|X = i) \Pr(X = i)} \quad (4)$$

On substituting the values from Table (II) we get:

$$\Pr(Y = 0|X = 1) = \frac{0.4 \times 0.3}{0.6 \times 0.7 + 0.4 \times 0.3} \quad (5)$$

$$= \frac{12}{54} \quad (6)$$

$$= \frac{2}{9} \approx 0.222 \quad (7)$$