

ASSIGNMENT 2

BT21BTECH11005 - MANIKANTA

PROBLEM:- Given three identical Boxes A , B and C , Box A contains 2 gold and 1 silver coin, Box B contains 1 gold and 2 silver coins and Box C contains 3 silver coins. A person chooses a Box at random and takes out a coin. If the coin drawn is of silver, find the probability that it has been drawn from the Box which has the remaining two coins also of silver.

SOLUTION:- Let $X = \{0, 1, 2\}$ be a random variable representing the BOXES and let $Y = \{0, 1\}$ be a random variable representing the COINS

See TABLE (I) and TABLE (II) for the input probabilities.

EVENT	DESCRIPTION
$X = 0$	selected BOX is A
$X = 1$	selected BOX is B
$X = 2$	selected BOX is C
$Y = 0$	coin drawn is SILVER
$Y = 1$	coin drawn is GOLD

TABLE I
ASSINGING RANDOM VARIABLES

PROBABILITY	VALUE
$P(X = 0)$	$\frac{1}{3}$
$P(X = 1)$	$\frac{1}{3}$
$P(X = 2)$	$\frac{1}{3}$
$P(Y = 0 X = 0)$	$\frac{1}{3}$
$P(Y = 0 X = 1)$	$\frac{2}{3}$
$P(Y = 0 X = 2)$	1
$P(X = 2 Y = 0)$???

TABLE II
PROBABILITY VALUES OF EVENTS

C , is equal to

$$P(X = 2 | Y = 0) = \frac{P(X = 2)P(Y = 0 | X = 2)}{\sum_{i=0}^2 P(X = i)P(Y = 0 | X = i)} \quad (1)$$

$$= \frac{\frac{1}{3} \times 1}{\frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times 1} \quad (2)$$

$$= \frac{\frac{1}{3}}{\frac{1}{9} + \frac{2}{9} + \frac{1}{3}} \quad (3)$$

$$= \frac{1}{3} \times \frac{9}{6} \quad (4)$$

$$P(X = 2 | Y = 0) = \frac{1}{2} \quad (5)$$

\therefore from (5),

Probability that the coin drawn is silver from box $C = \frac{1}{2}$.

now, by using BAYES THEOREM

Probability that the coin drawn is silver from box