ASSIGNMENT 2

BT21BTECH11005 - MANIKANTA

PROBLEM:-Given three identical Boxes A, B and C, Box A contains 2 gold and 1 silver coin, Box Bcontains 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 TABLES (I) and (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
$\Pr(X = 0)$	$\frac{1}{3}$
$\Pr(X = 1)$	$\frac{1}{3}$
$\Pr(X = 2)$	$\frac{1}{3}$
$\Pr(Y = 0 \mid X = 0)$	$\frac{1}{3}$
$\Pr(Y = 0 \mid X = 1)$	$\frac{2}{3}$
$\Pr(Y = 0 \mid X = 2)$	1
$\Pr(X = 2 \mid Y = 0)$	???

TABLE II
PROBABILITY VALUES OF EVENTS

now, by using BAYES THEOREM
Probability that the coin drawn is silver from box C,is equal to

$$\Pr(X = 2 \mid Y = 0) = \frac{\Pr(X = 2)\Pr(Y = 0 \mid X = 2)}{\sum_{i=0}^{2} \Pr(X = i)\Pr(Y = 0 \mid X = i)} \tag{1}$$

$$= \frac{\frac{1}{3} \times 1}{\frac{1}{3} \times \frac{1}{3} + \frac{1}{3} \times \frac{2}{3} + \frac{1}{3} \times 1} \tag{2}$$

$$= \frac{\frac{1}{3}}{\frac{1}{9} + \frac{2}{9} + \frac{1}{3}} \tag{3}$$

$$= \frac{1}{3} \times \frac{9}{6} \tag{4}$$

$$\Pr(X = 2 \mid Y = 0) = \frac{1}{2} \tag{5}$$

$\therefore$ from (5),

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