

Assignment3

CS20Btech11035 -NYALAPOGULA MANASWINI

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GATE XE-C QUESTION 17

Box-S has 2 white and 4 black balls and box-T has 5 white and 3 black balls. A ball is drawn at random from box-S and put in box-T. Subsequently, the probability of drawing a white ball from box-T is? (rounding off to 2 decimal places)

SOLUTION

Box-0 has 2 white and 4 black balls.

Box-1 has 5 white and 3 black balls.

Event	definition
W	Event of transferring white balls from box-0 to box-1
B	Event of transferring black balls from box-0 to box-1
C	Event of drawing white balls from box-1
$\Pr(W = 1)$	Probability of transferring one whiteball from box-0 to box-1
$\Pr(B = 1)$	Probability of transferring one blackball from box-0 to box-1
$\Pr(C = 1 W = 1)$	Probability of drawing a whiteball from box-1 after transferring white ball to box-1.
$\Pr(C = 1 B = 1)$	Probability of drawing a whiteball from box-1 after transferring black ball to box-1.

TABLE 0: Table 1

Probability	$\Pr(W = 1)$	$\Pr(B = 1)$	$\Pr(C = 1 W = 1)$	$\Pr(C = 1 B = 1)$
value	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{6}{9}$	$\frac{5}{9}$

TABLE 0: Table 2

$$\Pr(\text{drawn ball is white}) = \Pr(C = 1) \quad (0.0.1)$$

$$(0.0.2)$$

From Baye's theorem

$$\begin{aligned} \Pr(C = 1) &= \Pr(C = 1|W = 1) \times \Pr(W = 1) \\ &+ \Pr(C = 1|B = 1) \times \Pr(B = 1) \quad (0.0.3) \end{aligned}$$

Substituting values from table (0) in (0.0.3)

$$\Pr(C = 1) = \frac{6}{9} \times \frac{1}{3} + \frac{5}{9} \times \frac{2}{3} \quad (0.0.4)$$

$$= \frac{16}{27} \quad (0.0.5)$$

\therefore Probability of drawing white ball from box-1 = $\Pr(C = 1) = \frac{16}{27} = 0.59$



