Assignment 3-probability and Random Variable

Aravind-BM19MTECH11007

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problem statement: Suppose we have four box A,B,C and D containing coloured marbles as given below:

Box	Red	White	Black
A	1	6	3
B	6	2	2
C	8	1	1
D	0	6	4

one of the box has been selected at random and a single marble is drawn from it.If the marble is red.What is the probability that it was drawn from box A?Box B?Box C?

Solution:

Suppose

R:Event that Red marble is drawn

A:Event that marble is drawn from Box A

B:Event that marble is drawn from Box B

C:Event that marble is drawn from Box C

D:Event that marble is drawn from Box D

P(A): probability that Box A is selected = $\frac{1}{4}$

P(R/A): probability that Red marble is selected from Box A = $\frac{1}{10}$

P(B): probability that Box B is selected = $\frac{1}{4}$

p(R/B): probability that Red marble is selected from Box B = $\frac{6}{10}$

P(C): probability that Box C is selected = $\frac{1}{4}$

P(R/C): probability that Red marble is selected from Box C = $\frac{8}{10}$

P(D): probability that Box D is selected = $\frac{1}{4}$

P(R/D): probability that Red marble is selected from Box D = 0

P(R):Probability of getting a Red marble=

P(A)P(R/A)+P(B)P(R/B)+P(C)P(R/C)+P(D)P(R/D)

$= \frac{1}{4} \times \frac{1}{10} + \frac{1}{4} \times \frac{6}{10} + \frac{1}{4} \times \frac{8}{10}$

$= \frac{1}{4}(\frac{1}{10} + \frac{6}{10} + \frac{8}{10})$

$= \frac{1}{4} \times \frac{3}{2}$

part A

P(A/R):probability that marble is drawn from box A given it is Red marble=

$= \frac{p(R/A).P(A)}{P(R)}$

$= \frac{\frac{1}{10} \times \frac{1}{4}}{\frac{1}{4} \times \frac{3}{2}}$

$= \frac{1}{15}$

part B

P(B/R):probability that marble is drawn from box B given it is Red marble=

$= \frac{p(R/B).P(B)}{P(R)}$

$= \frac{\frac{6}{10} \times \frac{1}{4}}{\frac{1}{4} \times \frac{3}{2}}$

$= \frac{2}{5}$

part C

P(C/R):probability that marble is drawn from box C given it is Red marble=

$= \frac{p(R/C).P(C)}{P(R)}$

$= \frac{\frac{8}{10} \times \frac{1}{4}}{\frac{1}{4} \times \frac{3}{2}}$

$= \frac{8}{15}$