AI5002: Assignment 11

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Download all Python codes from

https://github.com/Debolena/AI5002−Probability−and−Random−Variables/blob/main/Assignment_11/assignment11_code_drawing%20balls.py

and latex-tikz codes from

https://github.com/Debolena/AI5002−Probability−and−Random−Variables/blob/main/Assignment_11/latex.tex

1 Problem

Gate problems in probability: Gate Q1
An urn contains 5 red balls and 5 black balls.In the first draw, one ball is picked at random and discarded without noticing its colour.The probability to get a red ball in the second draw is

1) $\frac{1}{2}$
2) $\frac{4}{9}$
3) $\frac{5}{9}$
4) $\frac{6}{9}$

2 Solution

Let $X_1 \in \{0, 1\}$ be the random variable denoting the colour of the ball picked up in the first draw and $X_2 \in \{0, 1\}$ be the random variable denoting the colour of the ball picked up in the second draw.
Let 0 represent a black ball and 1 represents a red ball.
We are to find, $P(X_2 = 1|X_1 = 0 \text{ or } 1)$

$$\therefore P(X_2 = 1|X_1 = 0 \text{ or } 1) \tag{2.0.1}$$
$$= P(X_2 = 1|X_1 = 0) + P(X_2 = 1|X_1 = 1) \tag{2.0.2}$$
$$= \frac{5}{10} \times \frac{5}{9} + \frac{5}{10} \times \frac{4}{9} \tag{2.0.3}$$
$$= \frac{1}{2} \tag{2.0.4}$$

Hence, option (1) is the correct answer.