AI1110: Probability and Random Variable Assignment-1

Mayank Parasramka*
AI22BTECH11018

Question: 11.16.4.4

Problem Statement:
In a certain lottery 10,000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy

 (a) one ticket
 (b) two tickets
 (c) 10 tickets.

Solution:
Given,
Tickets sold = 10,000
Prizes awarded = 10
Tickets with no awards = 10,000 - 10 = 9990

 (a) If one ticket is bought,
 'S_1'= Sample space = picking any one of the 10000 tickets.
 'A'= Event of not choosing one of the 10 prize tickets.

$$n(S_1) = {}^{10000}C_1 = 10000 \qquad (1)$$

$$n(A) = {}^{9990}C_1 = 9990 \qquad (2)$$

$$\Pr(A) = \frac{n(S_1)}{n(A)} = \frac{9990}{10000} \qquad (3)$$

$$\therefore \Pr(A) = \frac{999}{1000} \qquad (4)$$

 (b) If two tickets are bought,
 'S_2'= Sample space = picking any two of the 10000 tickets.

 'B'= Event of choosing any two tickets with no prize.

$$n(S_2) = {}^{10000}C_2 \qquad (5)$$

$$n(B) = {}^{9990}C_2 \qquad (6)$$

$$\Pr(B) = \frac{n(S_2)}{n(B)} \qquad (7)$$

$$\therefore \Pr(B) = \frac{{}^{10000}C_2}{{}^{9990}C_2} \qquad (8)$$

 (c) If 10 tickets are bought,
 'S_3'= Sample space = picking any 10 of the 10000 tickets.
 'C'= Event of choosing any 10 tickets with no prize.

$$n(S_3) = {}^{10000}C_{10} \qquad (9)$$

$$n(C) = {}^{9990}C_{10} \qquad (10)$$

$$\Pr(C) = \frac{n(S_3)}{n(C)} \qquad (11)$$

$$\therefore \Pr(C) = \frac{{}^{10000}C_{10}}{{}^{9990}C_{10}} \qquad (12)$$

*The student is with the Department of Artificial Intelligence, Indian Institute of Technology, Hyderabad, 502285, India. e-mail: ai22btech11018@iith.ac.in.