

AI1110: Probability and Random Variable

Assignment-2

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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,
'S₁' = Sample space = picking any one of the 10000 tickets.
'A' = Event of not choosing any one of the 10 prize tickets.

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

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

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

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

- (b) If two tickets are bought,
'S₂' = Sample space = picking any two of the 10000 tickets.

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

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

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

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

$$\Pr(B) = \frac{{}^{9990}C_2}{{}^{10000}C_2} = \frac{9990 \times 9989}{10000 \times 9999} \quad (8)$$

$$\therefore \Pr(B) = \frac{1108779}{1111000} \quad (9)$$

- (c) If 10 tickets are bought,
'S₃' = Sample space = picking any 10 of the 10000 tickets.
'C' = Event of choosing any 10 tickets with no prize.

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

$$n(C) = {}^{9990}C_{10} \quad (11)$$

$$\Pr(C) = \frac{n(C)}{n(S_3)} \quad (12)$$

$$\therefore \Pr(C) = \frac{{}^{9990}C_{10}}{{}^{10000}C_{10}} \quad (13)$$