

Assignment 2

AI1110: Probability and Random Variables

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11.16.3.11 Question: In a lottery, a person chooses six different natural numbers at random from 1 to 20, and if these six numbers match with the six numbers already fixed by the lottery committee, he wins the prize. What is the probability of winning the prize in the game? [Hint order of the numbers is not important.]

Solution: The person has to choose 6 distinct natural numbers from 1 to 20.

$$\text{Total number of combinations} = \binom{20}{6} \quad (1)$$

Let X be a random variable which takes the values 0 and 1.

$$X = \begin{cases} 1, & \text{if the combination is same as already fixed one} \\ 0, & \text{if the combination is not same as already fixed one} \end{cases}$$

$$\Pr(X = 1) = \frac{\text{Combinations fixed}}{\text{Total combinations}} \quad (2)$$

$$\Pr(X = 1) = \frac{1}{\binom{20}{6}} \quad (3)$$

$$\Pr(X = 1) = \frac{6! \times 14!}{20!} \quad (4)$$

$$\therefore \Pr(X = 1) = \frac{1}{38760} \quad (5)$$