

Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Technology Hyderabad

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Question[12.13.5.11]: Find the probability of getting 5 twice in 7 throws of a dice.

Solution: The repeated tossing of a die are Bernoulli trials. Let X represent the number of times of getting 5 in 7 throws of a die.

Probability of getting 5 in a single throw of die, $p = \frac{1}{6}$.

$$\therefore q = 1 - p = 1 - \frac{1}{6} = \frac{5}{6}$$

Clearly, X has the probability distribution with $n = 7$ and $p = \frac{1}{6}$

$$\therefore P(X = x) = {}^nC_x q^{n-x} p^x = {}^7C_x \left(\frac{5}{6}\right)^{(7-x)} \cdot \left(\frac{1}{6}\right)^x$$

Probability of getting 5 twice in 7 throws of a dice is $P(X = 2)$.

$$\begin{aligned} P(X = 2) &= {}^7C_2 \left(\frac{5}{6}\right)^{(7-2)} \cdot \left(\frac{1}{6}\right)^2 \\ &= \frac{7!}{2! \cdot (7-2)!} \cdot \left(\frac{5}{6}\right)^5 \cdot \left(\frac{1}{6}\right)^2 \\ &= 21 \cdot \left(\frac{5}{6}\right)^5 \cdot \left(\frac{1}{36}\right) \\ &= \left(\frac{7}{12}\right) \cdot \left(\frac{5}{6}\right)^5 \end{aligned}$$