Assignment 1

AI1110: Probability and Random Variables
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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, $p = \frac{1}{6}$.

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

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

$$\therefore\ \Pr(X = k) = {}^{n}C_k \times q^{n-k} \times p^k = {}^{7}C_k \times \left(\frac{5}{6}\right)^{(7-k)} \times \left(\frac{1}{6}\right)^k \tag{2}$$

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

$$\Pr(X = 2) = {}^{7}C_2 \times \left(\frac{5}{6}\right)^{(7-2)} \times \left(\frac{1}{6}\right)^2 \tag{3}$$

$$= \frac{7!}{2! \times (7-2)!} \times \left(\frac{5}{6}\right)^5 \times \left(\frac{1}{6}\right)^2 \tag{4}$$

$$= 21 \times \left(\frac{5}{6}\right)^5 \times \left(\frac{1}{36}\right) \tag{5}$$

$$= \left(\frac{7}{12}\right) \times \left(\frac{5}{6}\right)^5 \tag{6}$$