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Probability Assignment-III

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I. Problem

Find the mean number of heads in three tosses of a fair coin.

II. Solution

Consider each trial results in success (i.e Heads) or failure (i.e Tails).

Let p and q = (1 - p) be the probability of success and failure respectively.

$$p = \frac{1}{2}; q = 1 - p = \frac{1}{2} \tag{1}$$

In n Bernoulli trials with x success and (n - x) failures, the probablity of x success in n- Bernoulli trials can be given as

$$^{n}C_{x} p^{x} q^{n-x} \tag{2}$$

Now the distribution of number of successes using (1) & (2) can be given as,

X	0	1	2	3
P(X)	$^{3}C_{0}(\frac{1}{2})^{3}$	$^{3}C_{1}(\frac{1}{2})^{3}$	$^{3}C_{2}(\frac{1}{2})^{3}$	$^{3}C_{3}(\frac{1}{2})^{3}$

Mean of X = $\mu = \sum_{i=1}^{n=3} x_i P(x_i)$

$\mu = 0 \times^{3} C_{0}(\frac{1}{2})^{3} + 1 \times^{3} C_{1}(\frac{1}{2})^{3} + 2 \times^{3} C_{2}(\frac{1}{2})^{3} + 3 \times^{3} C_{3}(\frac{1}{2})^{3}$

$\therefore$ Mean of X = μ = 1.5