Assignment

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Question 12.13.3.6 Explain why the experiment of tossing a coin three times is said to have binomial distribution

Solution: let X be the event of tossing coin and bernoulli distribution is

$$X = \begin{cases} 1 & \text{toss is heads ; probability } p \\ 0 & \text{toss is tails ; probability } q = 1 - p \end{cases} \tag{1}$$

$$\tag{2}$$

Then the Expectation is

$$E\left[z^{-X}\right] = qz^{0} + pz^{-1} \tag{3}$$

$$= q + pz^{-1} \tag{4}$$

Then for n trials, the Expectation is

$$E\left[z^{-X}\right]^{n} = E\left[p_i\right]^{n} \tag{5}$$

$$= \left(q + pz^{-1}\right)^{n} \tag{6}$$

$$= \sum_{r=0}^{n} {}^{n}C_{r} \left(pz^{-1}\right)^{r} q^{n-r} \tag{7}$$

Now by getting pmf by comparing coefficients

$$\Pr\left(X = i\right) = {}^{n}C_{i} p^{i} \left(1 - p\right)^{n-i} \tag{8}$$

which is in binomial distribution

$\therefore$ tossing 3 coins has binomial distribution