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 discrete random variable which takes values $X \in \{0, 1, 2, 3 \dots\}$ and pmf is

$$p_i = \Pr(X = i) \tag{1}$$

Then Expectation is

$$E\left[z^X\right] = \sum_{i=0}^{\infty} p_i z^i \tag{2}$$

for 1 trials let X be the event of tossing coin

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

$$= q + pz \tag{4}$$

Then for n trials

$$E\left[z^X\right]^n = (q + pz)^n \tag{5}$$

$$= \sum_{r=0}^{n} {}^nC_r \, (pz)^r \, q^{n-r} \tag{6}$$

Now by comparing coefficients

$$\Pr(X = i) = {}^nC_i p^i \, (1 - p)^{n-i} \tag{7}$$

which is in binomial distribution

$\therefore$ tossing 3 coins has binomial distribution