Probability & Random Variables
AI1110

Himanshu Boora
BT22BTECH11008

Question

I toss three coins together. The possible outcomes are no heads, 1 head, 2 heads and 3 heads. So, I say that probability of no heads is 1/4 . What is wrong with this conclusion?

Solution

Let the coin be fair.
X = number of heads.
n : no of coin tosses.
r : no of heads as outcome.
p : probability of getting heads.
q : probability of getting tails.
The binomial dristribution is,

$$p_X(r) = \binom{n}{r} p^r q^{n-r} \tag{1}$$

As the coin is fair

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

then pmf would be,

$$p_X(r) = \binom{n}{r} (\frac{1}{2})^n \tag{3}$$

According to the narrator,

$$p_X(0) = \frac{1}{4} \tag{4}$$

The probability of no heads in the outcome i.e X = 0 is.

$$p_X(0) = \binom{3}{0} (\frac{1}{2})^3 \tag{5}$$

$$= (\frac{1}{2})^3 \tag{6}$$

$$= \frac{1}{8} \tag{7}$$

$\therefore$ The conclusion is wrong .