

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?

The probability of no heads in the outcome is.

$$p_X(0) = \binom{3}{0} \left(\frac{1}{2}\right)^3 \quad (4)$$

$$= \left(\frac{1}{2}\right)^3 \quad (5)$$

$$= \frac{1}{8} \quad (6)$$

\therefore The conclusion is wrong.

Solution

Let the coin be fair.
The binomial distribution is,

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

Parameter	Value	Description
n	3	no of coin tosses
r	0	no of heads
p	$\frac{1}{2}$	probability of getting heads
q	$\frac{1}{2}$	probability of getting tails

then pmf would be,

$$p_X(r) = \binom{n}{r} \left(\frac{1}{2}\right)^n \quad (2)$$

According to the narrator,

$$p_X(0) = \frac{1}{4} \quad (3)$$