Probability & Random Variables
AI1110

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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

$\implies$ Let the probability of heads be p.

The narrator of the Question has concluded that the probability of the no heads(zero heads) is $\frac{1}{4}$, by assuming that it is one of the four equally likely posibilities :
{no heads, 1 head, 2 heads and 3 heads}
$\implies$ Let a random variable X be number of heads
$\implies$ Let getting heads be success
Then P(X=r) = ${}^{n}C_{r}p^{r}(1-p)^{n-r}$ where r=0, 1, 2, 3
the probability of no heads in the outcome i.e X = 0 is .
P(X=0) = ${}^{3}C_{0}p^{0}(1-p)^{3-0}$
P(X=0) = $(1-p)^{3}$
P(X=0) = $(1-p)^{3} = \frac{1}{4}$
(1-p)= $1/4^{1/3}$
p = 1 - $1/4^{1/3}$
p = 0.36712
if the probability of getting heads is 1 - $1/4^{1/3}$, then it would be correct , but the narrate of the question did'nt state about the probabilities of heads or tails.
Therefore it is not entirely correct to state the probability by only seeing the outcome of the coin .