

# 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*

Let the coin be fair.  
X = number of heads.  
According to the narrator,

$$\Pr(X = 0) = \frac{1}{4} \quad (1)$$

Probability of getting X=r heads is

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

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

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

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

$$= \frac{1}{8} \quad (5)$$

∴ The conclusion is wrong .