AI1110 - Assignment1

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Question: 10.13.2.12 Sushma tosses a coin 3 times and gets tail each time. Do you think that the outcome of next toss will be a tail? Give reasons. **Solution:** As the coin is tossed 3 times and gets a tail each time but it is not necessary that 4th time will be a tail. It may be either tail or head in any further toss. Let X be the random variable for the occarance of tail. In this binomial distribution, $n = 4$. $P(X = x) = \binom{n}{x} q^{n-x} p^x$, where x can be a number from 0 to n, $p = q = \frac{1}{2}$. $P(X = 0) = \binom{4}{0} q^{4-0} p^0 = \binom{4}{0} (\frac{1}{2})^{4-0} (\frac{1}{2})^0 = (\frac{1}{16})$. $P(X = 1) = \binom{4}{1} q^{4-1} p^1 = \binom{4}{1} (\frac{1}{2})^{4-1} (\frac{1}{2})^1 = (\frac{1}{4})$. $P(X = 2) = \binom{4}{2} q^{4-2} p^2 = \binom{4}{2} (\frac{1}{2})^{4-2} (\frac{1}{2})^2 = (\frac{3}{8})$. $P(X = 3) = \binom{4}{3} q^{4-3} p^3 = \binom{4}{3} (\frac{1}{2})^{4-3} (\frac{1}{2})^3 = (\frac{1}{4})$. $P(X = 4) = \binom{4}{4} q^{4-4} p^4 = \binom{4}{4} (\frac{1}{2})^{4-4} (\frac{1}{2})^4 = (\frac{1}{16})$. As the coin in unbiased, Probability of $Head = Tail = \frac{1}{2}$ in every single case. Hence, the given statement is false.