ASSIGNMENT 1

N.Keerthana

CS22BTECH11043

Exempler:10.13.2.13 - If I toss a coin 3 times and get head each time, should I expect a tail to have a higher chance in the 4th toss? Give reason in support of your answer.

Solution: No.Because each coin toss is independent.

TABLE 0
DEFINING RANDOM VARIABLES X AND Y

Randomvariable	Definition
X	number of heads achieved in first 3 coin tosses
Y	Y = 1 if 4th coin toss is head and 0 if tail

X ~ B(3, p)
p = Probability of head = $\frac{1}{2}$

Since X occurs before Y,X is independent of Y

$$\Pr(Y = 1 \mid X = 3) = \frac{\Pr(Y = 1, X = 3)}{\Pr(X = 3)} \quad (1)$$

$$= \frac{\Pr(X = 3).\Pr(Y = 1)}{\Pr(X = 3)} \quad (2)$$

$$= \frac{\binom{3}{3}\frac{1}{2}^4}{\binom{3}{3}\frac{1}{2}^3} = 0.5 \quad (3)$$

$$\Pr(Y = 0 \mid X = 3) = \frac{\Pr(Y = 0, X = 3)}{\Pr(X = 3)} \quad (4)$$

$$= \frac{\Pr(X = 3).\Pr(Y = 0)}{\Pr(X = 3)} \quad (5)$$

$$= \frac{\binom{3}{3}\frac{1}{2}^4}{\binom{3}{3}\frac{1}{2}^3} = 0.5 \quad (6)$$

Hence there is equal chance for head and tail on 4th coin toss.