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

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

Since X occurs before Y,X is independent of Y

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

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

$$= \Pr(Y = 1) = 0.5 \tag{3}$$

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

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

$$= \Pr(Y = 0) = 0.5 \tag{6}$$

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