

STU22004 – Sample Questions 4

1. The cumulative probability function of random variable X is given as

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{x}{4} & 0 \leq x < 1 \\ a + \frac{x-1}{4} & 1 \leq x < 2 \\ b & 2 \leq x < 3 \\ 1 & x \geq 3 \end{cases}$$

If $P(X = 1) = \frac{1}{4}$ and $P(X = 2) = \frac{1}{6}$, Find a and b .

2. Flipping a coin, what is the probability of seeing the 4th tail in the 5th flip and seeing the 8th tail in the 10th flip?
3. In a Binomial distribution $E[X] = 3$ and $Var[X] = 2$. Find $P(X \geq 1)$.
4. In a Binomial distribution $n = 400$ and $p = \frac{1}{80}$. Find $P(4 < X \leq 5)$.
5. In a Poisson distribution $\hat{x} = 1$ & 2. Find $P(X = 4)$.
6. X_1 and X_2 are independent Poisson rvs with means α and β respectively, what is the variance of $\frac{X_2}{\alpha} - \frac{X_1}{\beta}$?
7. A shop has 4 customers per hour. What is the probability of having no customer in 30 minutes?
8. X_1 and X_2 are observed numbers when rolling 2 dice. What is the variance of $3X_1 + 2X_2 + 5$?
9. If X_i s are iid Bernoulli rvs, what is the $E[(X_1 + X_2^2 + \dots + X_n^n)^2]$?
10. A blind mouse is at a crossroad! 3 routes are connected and the 4th one takes him to his house. What is the expected number of his travels through the routes to get to his house?