

B

1. For the population of all persons who belong to a music club, let the probability distribution

$$f(x) = P[X = x] \text{ for } x = 0, 1, 2, \dots$$

describe the number of visits to the club Internet site, in the past week, for each person.

A sample of size one is selected by randomly choosing a day of the week and then a time of day. The next club member to visit the site after that time is asked to report the number of visits in the past week.

Does this procedure produce 1 observation from $f(x)$? Explain your answer.

2. (4 points) In a random sample of 85 components of a certain type, 34 are found to be defective.

Give a point estimate of the proportion of all such components that are defective. Also give the estimated standard error of your estimate.

3. (6 points) Let X and Y have the joint distribution the probability distribution $f(x, y) = P[X = x, Y = y]$ given by

| | | | |
|---|---|----|----|
| | | x | |
| | | 0 | 1 |
| | 0 | .1 | 0 |
| y | 1 | .2 | .1 |
| | 2 | .4 | .2 |

- (a) Find the conditional distribution of Y given $X = 0$ and the conditional distribution of Y given $X = 1$.
- (b) Find $E[Y | X = 0]$ and $E[Y | X = 1]$
- (c) Find the variance of $E[Y | X]$
4. Refer to Problem 3. Are X and Y independent? Explain.
5. Let X_1 and X_2 be independent with
- $E[X_1] = 2$ and $var(X_1) = 1$
- $E[X_2] = 1$ and $var(X_2) = 3$
- Find the mean and variance of $2X_1 - 4X_2$.

6. A mega grocery store employee notices that $n = 64$ customers spent an average of 104.40 dollars with a standard deviation of 34.72 dollars
- (a) Obtain a (two-sided) 98% confidence interval for the population mean, μ , amount spent by a customer.
 - (b) Does μ lie in your interval obtained in Part(a)? Explain your answer.
 - (c) In long series of repeated experiments with new samples of size 64, what proportion of the resulting confidence intervals will contain the true mean? Explain your reasoning.
7. Consider a random sample of size n from the distribution having

$$P[X = x : \theta] = f(x : \theta) = \frac{2}{\theta} x e^{-x^2/\theta} \quad \text{for } x > 0$$

where $\theta > 0$. Suppose $n = 49$ and $\sum_{i=1}^{49} x_i^2 = 73.5$

- (a) Determine if a one-dimensional sufficient statistic exists. If so, find it.
- (b) Determine the maximum likelihood estimate for θ