Department of Mathematics and Statistics KFUPM
STAT 319-02 Quiz#2, Time: 30 mins

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Q.No.1:- A safety engineer claims that only 40% of all workers wear safety helmets when they eat lunch at the workplace. Assuming that his claim is right, find the probability that 4 of 6 workers randomly chosen will be wearing their helmets while having lunch at the workplace.

Q.No.2:- On average, there are 3.2 defects per 100 square meters of some fabric. Assume that the number of defects follows a Poisson distribution.

a) What is the probability that the next defect will be seen in less than 30 square meters?

b) What is the expected area to see the next defect?

Q.No.3:- An aircraft emergency locator transmitter (ELT) is a device designed to transmit a signal in the case of a crash. The Altigauge Manufacturing Company makes 80% of the ELTs, the Bryant Company makes 15% of them, and the Chartair Company makes the other 5%. The ELTs made by Altigauge have a 4% rate of defects, the Bryant ELTs have a 6% rate of defects, and the Chartair ELTs have a 9% rate of defects. If an ELT is randomly selected from the general population of all ELTs, find the probability that it is defective.

STAT-319 Formula Sheet for First Major Exam Term 143

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = P(A \cap B') + P(A \cap B) + P(A' \cap B)$$

$$P(A \cup B) = 1 - P(A \cup B)' = 1 - P(A' \cap B') \quad \text{and} \quad P(A \cap B)' = P(A' \cup B')$$

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)},\ P(B) \neq 0 \qquad \text{and} \qquad P(A \cap B) = P(A).P(B \mid A) = P(A \mid B).P(B)$$

$$P(B_i \mid A) = \frac{P(A \mid B_i).P(B_i)}{\sum_{i=1}^{k} P(A \mid B_i).P(B_i)},\ P(A) \neq 0$$

$$\mu = E(X) = \sum x f(x); \quad E(X^2) = \sum x^2 f(x) \quad \text{and} \quad \sigma^2 = E(X-\mu)^2 = E(X^2) - \mu^2$$

$$f(x) = \frac{1}{n}; \quad x = x_1, x_2, \dots, x_n; \quad \mu = \frac{x_n + x_1}{2}; \quad \sigma^2 = \frac{(x_n - x_1 + 1)^2 - 1}{12}$$

$$f(x) = \binom{n}{x} p^x (1-p)^{n-x}; \quad x = 0,1,\dots,n; \quad \mu = np; \quad \sigma^2 = np(1-p)$$

$$f(x) = p(1-p)^{x-1}; \quad x = 1,2,\dots\dots; \quad \mu = 1/p; \quad \sigma^2 = (1-p)/p^2$$

$$f(x) = \frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}}; \quad x = \max\{0, n+K-N\} \text{ to } \min\{K, n\}; \mu = np; \quad \sigma^2 = np(1-p)\frac{N-n}{N-1}; \quad p = \frac{K}{N}$$

$$f(x) = \frac{e^{-\lambda t}(\lambda t)^x}{x!}; \quad x = 0,1,\dots\dots; \mu = \lambda t; \quad \sigma^2 = \lambda t$$

$$F(b) = P(X \leq b) = \int_{-\infty}^{b} f(x)\,dx \quad \text{and} \quad P(a < X < b) = \int_{a}^{b} f(x)\,dx = F(b) - F(a)$$

$$\mu = E(X) = \int_{-\infty}^{\infty} x f(x)\,dx; \quad E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)\,dx \quad \text{and} \quad \sigma^2 = E(X-\mu)^2 = E(X^2) - \mu^2$$

$$f(x) = \frac{1}{x_n - x_1}; \quad x_1 \leq x \leq x_n; \quad \mu = \frac{x_n + x_1}{2}; \quad \sigma^2 = \frac{(x_n - x_1)^2}{12}$$

$$f(x) = \lambda e^{-\lambda x}; \quad x > 0; \quad \mu = \frac{1}{\lambda}; \quad \sigma^2 = \frac{1}{\lambda^2}$$