Department of Mathematics and Statistics KFUPM
STAT 319-03, Term 151, Quiz#1, Time: 25 mins

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Q.No.1:- A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at different times. In fact, plans 1 and 2 are used for 30% and 20% of the products, respectively. The defect rate for the plans 1, 2, and 3 are 1%, 3%, and 2% respectively. If a random product was observed and found to be defective, which plan was most likely used and thus responsible?

Q.No.2:- Is each statement below True or False? Give an explanation.

a. The probability that a mineral sample will contain silver is 0.38 and the probability that it will not contain silver is 0.52.

b. The probability that a student will get an A in STAT 319 is 0.3, and the probability that he will get either and A or a B is 0.27.

c. A company is constructing two buildings; the probability that the larger one will be completed on time is 0.35 and the probability that both will be completed on time is 0.42.

Q.No.3:- A manufacturer of automobiles conducted a market survey. Eighty percent of the customers want better fuel efficiency, while 55% want a vehicle navigation system and 45% percent want both features.

a. Find the probability that a person wants either better fuel efficiency or a vehicle navigation system.

b. Find the probability that a person wants better fuel efficiency but not a vehicle navigation system.

c. Find the probability that a person wants a vehicle navigation system given that he also wants a better fuel efficiency.

d. let the event A: the customers want better fuel efficiency, B: the customers want a vehicle navigation system, are the two events independent? Explain using probability.

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

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

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

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

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

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

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

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

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

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