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 an 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.

\[
P(A \cup B) = P(A) + P(B) - P(A \cap B) = P(A \cap B') + P(A \cap B) + P(A' \cap B)
\]
\[
P(A \cup B) = 1 - P(A \cup B') = 1 - P(A' \cap B') \quad \text{and} \quad P(A \cap B)' = P(A' \cup B')
\]
\[
P(A \mid B) = \frac{P(A \cap B)}{P(B)} \neq 0 \quad \text{and} \quad P(A \cap B) = P(A) \cdot P(B \mid A) = P(A \mid B) \cdot P(B)
\]
\[
P(B_i \mid A) = \frac{P(A \cap B_i) \cdot P(B_i)}{\sum_{i=1}^{k} P(A \cap B_i) \cdot P(B_i)}, P(A) \neq 0
\]
\[
\mu = E(X) = \sum x f(x); \quad E(X^2) = \sum x^2 f(x) \quad \text{and} \quad \sigma^2 = E(X - \mu)^2 = E(X^2) - \mu^2
\]
\[
f(x) = \frac{1}{n}; \quad x = x_1, x_2, \ldots, x_n; \quad \mu = \frac{x_n + x_1}{2}; \quad \sigma^2 = \frac{(x_n - x_1 + 1)^2 - 1}{12}
\]
\[
f(x) = \binom{n}{x} p^x (1 - p)^{n-x}; \quad x = 0, 1, \ldots, n; \quad \mu = np; \quad \sigma^2 = np(1 - p)
\]
\[
f(x) = (1-p)^{x-1}; \quad x = 1, 2, \ldots; \quad \mu = 1/p; \quad \sigma^2 = (1 - p)/p^2
\]
\[
f(x) = K \binom{n-K}{n-x}; \quad x = \max\{0, n + K - N\} \to \min\{K, n\}; \quad \mu = np; \quad \sigma^2 = np(1 - p) \frac{N-n}{N-1}; \quad p = \frac{K}{N}
\]
\[
f(x) = e^{-\lambda t} \left(\frac{\lambda t}{x!}\right)^x; \quad x = 0, 1, \ldots; \quad \mu = \lambda t; \quad \sigma^2 = \lambda t
\]