Question 1: What is a random variable in probability theory?

Answer: A random variable is a function that assigns numerical values to outcomes of a random experiment.

Question 2: What are the types of random variables?

Answer: There are two types: discrete random variables and continuous random variables.

Question 3: Explain the difference between discrete and continuous distributions.

Answer: Discrete distributions deal with countable values, while continuous distributions deal with values in a range.

Question 4: What is a binomial distribution, and how is it used in probability?

Answer: It gives the probability of a fixed number of successes in independent trials.

Question 5: What is the standard normal distribution, and why is it important?

Answer: It is a normal distribution with mean 0 and standard deviation 1, used for standardization.

Question 6: What is the Central Limit Theorem (CLT), and why is it critical?

Answer: CLT states that the sampling distribution of the mean approaches normality as sample size increases.

Question 7: What is the significance of confidence intervals?

Answer: They provide a range in which the true population parameter is likely to lie.

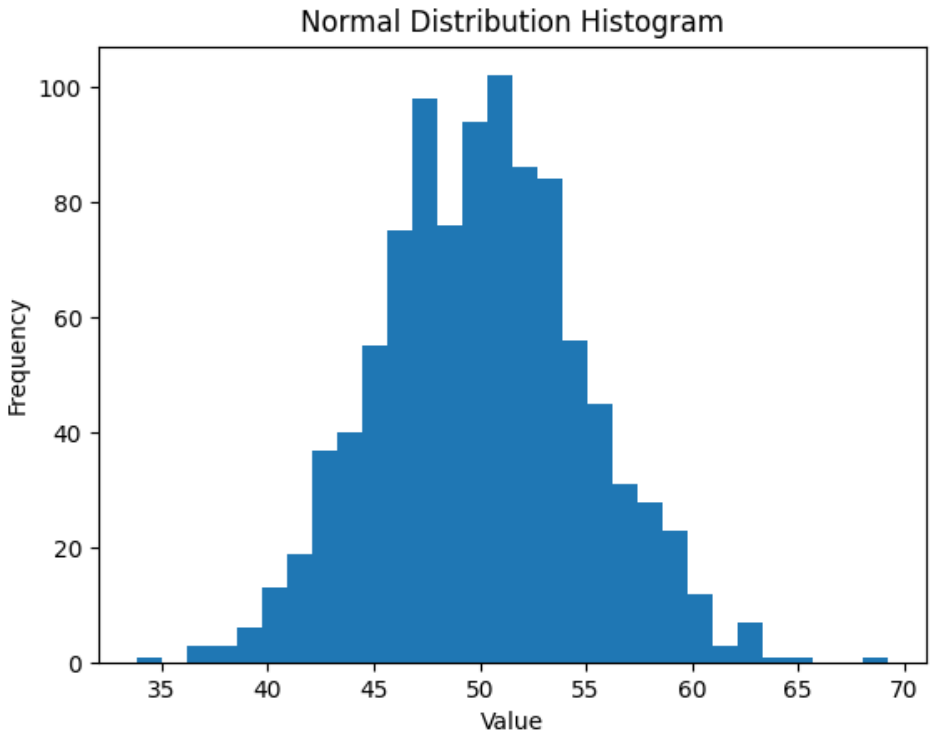
Question 8: What is expected value?

Answer: It is the long-run average value of a random variable over repeated experiments.

Question 9: Normal Distribution using Python

Python code generates 1000 random values from a normal distribution and calculates mean and standard deviation using NumPy.

Output → Mean: 50.10, Std Dev: 4.89



Question 10: Sales Trend using CLT

Using CLT, the mean sales and 95% confidence interval are calculated to identify trends.

Mean Sales: 248.25
95% Confidence Interval: (240.68, 255.82)