Tutorial: Sampling Distributions and Confidence Intervals

1. The scores of students on a standardized test are normally distributed with a mean of 500 and a standard deviation of 100. A random sample of 25 students is selected. Calculate the mean and standard deviation of the sampling distribution of the sample mean $\bar{x}$.

2. The heights of adults in a city are normally distributed with a mean of 170 cm and a standard deviation of 8 cm. A random sample of 36 adults is taken. Calculate the mean and standard deviation of the sampling distribution of the sample mean $\bar{x}$.

3. The battery life of smartphones is normally distributed with a mean of 12 hours and a standard deviation of 2 hours. A random sample of 49 smartphones is tested. Calculate the mean and standard deviation of the sampling distribution of the sample mean $\bar{x}$.

4. The travel time for commuters in a city has a skewed-right distribution with a mean of 30 minutes and a standard deviation of 10 minutes. A random sample of 100 commuters is selected. Calculate the mean and standard deviation of the sampling distribution of the sample mean $\bar{x}$.

5. The heights of all adults in a city are normally distributed with a mean of 68 inches and a standard deviation of 4 inches. Find the probability that the mean height of a random sample of 100 adults is:
   a. less than 67.8 inches
   b. between 67.5 inches and 68.7 inches
   c. within 0.6 inches of the population mean
   d. less than the population mean by 0.5 inches or more

6. Test scores for students in a school are normally distributed with a mean of 75 and a standard deviation of 10. For a random sample of 25 students, find the probability that the sample mean score is:
   a. greater than 78
   b. between 72 and 77
   c. within 2 points of the population mean
   d. greater than the population mean by 3 points or more

7. A researcher took a sample of 30 students' test scores with an average score of 85 and a standard deviation of 5. What is the 95% confidence interval for the test scores?

8. A study measures the heights of 50 people, finding an average height of 170 cm with a standard deviation of 10 cm. What is the 99% confidence interval for the population's height?

9. In a sample of 40 light bulbs, the mean lifetime is 5000 hours and the standard deviation is 400 hours. Compute a 90% confidence interval for the average lifetime of the bulbs.

10. A random sample of 40 teenagers reports an average daily screen time of 4.5 hours, with a sample standard deviation of 1.2 hours. Construct a 90% confidence interval for the population mean daily screen time.

END OF TUTORIAL QUESTIONS