

Tutorial Sheet 5

Please prioritise the questions marked with an asterisk (*) and the multiple-choice questions. If time permits, feel free to attempt the remaining questions. I will be reviewing all questions during the tutorial.

Confidence Intervals

Question 1 *

Given a $\mu = 100$ and $\sigma^2 = 25$, calculate the following:

- a. 95% confidence intervals with a sample size of 200;
- b. 90% confidence intervals with a sample size of 200;
- c. 99% confidence intervals with a sample size of 200.
- d. 95% confidence intervals with a sample size of 400;

Question 2

Given a sample proportion of $\hat{p} = 0.3$, calculate the following:

- a. 95% confidence intervals with a sample size of 300;
- b. 90% confidence intervals with a sample size of 300;
- c. 99% confidence intervals with a sample size of 300.
- d. 95% confidence intervals with a sample size of 900;

Question 3 *

A factory produces light bulbs with an average lifespan of 1500 hours and a standard deviation of 100 hours. A sample of 100 bulbs is taken to determine if the average lifespan is still the same. Assuming a normal distribution of the sample, calculate a 95% confidence interval for the true mean lifespan of the bulbs.

Question 4

A manufacturer produces steel bars that are supposed to be 10 inches long. A sample of 50 bars is taken, and the sample mean length is found to be 9.8 inches with a sample standard deviation of 0.4 inches. Assuming a normal distribution of the sample, calculate a 99% confidence interval for the true mean length of the bars.

Question 5

A school district wants to estimate the proportion of students who passed a standardized test in a particular subject. A random sample of 200 students is selected and 120 of them passed the test. Calculate a 99% confidence interval for the true proportion of students who passed the test in the district.

Question 6 *

A company conducted a survey of 500 customers and found that 300 of them are satisfied with the product they purchased. Calculate a 90% confidence interval for the true proportion of satisfied customers in the population.

Multiple-Choice Questions

MCQ Question 7

For a 95% confidence interval for a population mean, which of the following is true?

- a) The interval contains 95% of the data points in the sample
- b) The population mean will fall within the interval 95% of the time if we repeat the sampling
- c) The sample mean falls within the interval 95% of the time
- d) 95% of the sample data falls within this interval

MCQ Question 8

If you increase the sample size while keeping the confidence level the same, the confidence interval will:

- a) Become wider
- b) Become narrower
- c) Remain the same
- d) Shift towards the lower bound

MCQ Question 9

Which of the following affects the width of a confidence interval for a population proportion? a) The sample proportion but not the sample size

- b) The sample size but not the confidence level
- c) Both the sample size and the confidence level
- d) Neither the sample size nor the sample proportion

MCQ Question 10

If the confidence level increases from 95% to 99%, the corresponding confidence interval will:

- A) Become narrower.
- B) Become wider.
- C) Remain the same.
- D) Depend on the sample standard deviation.

Question 11

Write your own confidence interval question.