Learning Goals

- Explain why sample statistics are used to estimate population parameters and why confidence intervals are more informative than point estimates alone.
- Describe the meaning of a confidence interval and interpret it correctly in the context of repeated sampling.
- Construct and interpret confidence intervals for a population mean when the population standard deviation is known or unknown.
- Construct and interpret a confidence interval for a population proportion.
- Explain how confidence level, sample size, and variability affect the width of a confidence interval.

Key Definitions / Functions

- `population parameter/sample statistic:`
- `standard error:`
- `qnorm()/qt():`
- `CI for when` σ `is known:`
- `CI for when` σ `is unknown:`
- `CI for proportions:`
- `t.test():`

Practice Problems

For each task below, write the R code you would use and briefly describe what you expect the output to look like.

1. Suppose a sample mean for an exam is $\overline{x} = 77$, the population standard deviation is $\sigma = 12$, and the sample size is $n = 36$. Construct a 95% confidence interval for the population mean using the appropriate z-value.

2. Suppose a random sample of 16 students had a sample mean quiz score of 84 and a sample standard deviation of 10. Construct a 95% confidence interval for the population mean using the appropriate t-value.

3. A survey finds that 58 out of 100 students say they study with music. Construct a 95% confidence interval for the population proportion of students who study with music.

4. Explain how the confidence interval will change if the confidence level or sample size is altered