

### Learning Goals

- Explain the relationship between populations and samples in statistical inference.
- Describe how the Law of Large Numbers connects to sampling variability.
- Differentiate between a sample distribution and a sampling distribution.
- Interpret how sample size affects the mean and standard deviation of a sampling distribution.
- State and explain the Central Limit Theorem and its importance in data science.

### Key Terms

Define each term in your own words and include an example when possible.

- Population:
- Sample:
- Law of Large Numbers:
- Sampling Distribution:
- Population Mean ( $\mu$ ):
- Sample Mean ( $\bar{x}$ ):
- Population Standard Deviation ( $\sigma$ ):
- Sample Standard Deviation ( $s$ ):
- Central Limit Theorem:

## Key Concepts

1. How is a sample different from a population?
2. What does the Law of Large Numbers tell us as the sample size increases?
3. When we increase the number of samples, how does the sampling distribution change?
4. What happens to the mean of the sampling distribution as the sample size grows?
5. What happens to the standard deviation of the sampling distribution as the sample size grows?
6. What does the Central Limit Theorem say about the shape of the sampling distribution of means?
7. If a population has a mean of 13 and a standard deviation of 5, what will the mean and standard deviation be for the sample distribution if the sample size is 100?