Statistical inference: provides method for drawing conclusion about a population from sample data.

Statistical estimation:

unknown mean $\mu$ for a population.

known mean $\bar{x}$, standard deviation $\sigma$ for $n$ sample size.

=> Sampling distribution of $\bar{x}$ is $N(\mu, \sigma/\sqrt{n})$

=> to find 95% confidence interval, $\mu \in [\bar{x} - 2 \cdot \sigma/\sqrt{n}, \bar{x} + 2 \cdot \sigma/\sqrt{n}]$

=> A level C confidence interval: estimate ± margin error

C% confidence level: "We got these numbers using a method that gives correct results 95% of the time".

A level C confidence interval for $\mu$ is $\bar{x} \pm z \cdot \sigma/\sqrt{n}$, where $z$ is the critical number.

Confidence intervals: the four-step process

State: find the pratical question that requires estimating a parameter

Plan: identify the parameter, choose a level of confidence, and pick a type of confidence interval.

Solve: Carry out the work in two phases:

1. Check the condition for the interval that you plan to use
2. Calculate the confidence interval.

Conclude: return to the pratical question

To get a smaller marginal error: $z \downarrow$ $\sigma \downarrow$ $n \uparrow$

Resampling: use individual observation in a sample to construct the relevant sampling distribution for inference

Bootstrap samples: generating many samples by sampling with replacement from the original sample.