Fact Sheet – Confidence Interval for an Unknown Population Mean μ (9.2)

In this section we learn to construct a confidence interval for an unknown population mean (μ) based upon the sample mean $(\bar{x})$.

Example: A random sample of 200 COS students had a mean age of 23.4 years old with a standard deviation of 6.7 years. Construct a 95% confidence interval for the mean age of all COS students.

Conditions

To construct a confidence interval for an unknown population proportion, p, the following three conditions must be met.

- The sample is independently obtained using simple random sampling or through a randomized experiment.
- $20n \le N$
- The data comes from a population that is normally distributed (QQ Plot) and has no outliers (Boxplot).
  (You only have to check the third condition if you have the data, otherwise we assume it is true.)

Margin of Error	Lower Bound	Upper Bound
$E = t \cdot \frac{s}{\sqrt{n}}$	$\bar{x} - E$	$\bar{x} + E$

Interpretation

We are ___ % sure that the true population mean μ is between _Lower Bound_ & _Upper Bound_.

StatCrunch Steps

Conditions

- Normally Distributed? Graphics > QQ Plot - Compare correlation statistic to table of critical values.
- Outliers? Graphics > Boxplot – Be sure to select option that shows outliers.

Confidence Interval

- If you have the sample mean & standard deviation:
  Stat > T Statistics > One Sample > with summary
  Enter the mean, standard deviation, and size. Next.
- If you have the data set:
  Construct QQ Plot & Boxplot to check conditions.
  Stat > T Statistics > One Sample > with data
  Select the column. Next.
- Select the Confidence Level radio button and enter the level of confidence. Calculate.
- Round the lower bound and upper bound to 2 decimal places.

Confidence Intervals for an Unknown Population Mean, Sigma Unknown (Section 9.2)

1) A major company has a large fleet of cars. A vice-president feels that gas costs are too high, and this is because the cars in the fleet get poor gas mileage. A random sample of 15 cars produced a mean mileage of 17.9 miles per gallon with a standard deviation of 3.9 miles per gallon. Construct a 95% confidence interval for the mean mileage for all of the cars in the fleet.

2) Here are 10 randomly selected blood sugar levels from a laboratory. (Levels measured after a 12-hour fast in mg/DL.)

105	89	96	135	94	91	111	107	141	83

Construct a 90% confidence interval for the mean blood sugar level of all people after a 12-hour fast.

3) How old are the students at a local community college? The president of the college claims that the mean age of the students at her school is 25. A random sample of 25 students produced a mean age of 25.8 years with a standard deviation of 9.83 years.

a) Construct a 95% confidence interval for the mean age of all students at her community college.

b) Is the president's claim consistent with your interval? Explain your answer in your own words.

4) A certain brand of candy makes a package that they claim contains at least 110 candies. A random sample of 18 packages had a mean of 123.5 candies with a standard deviation of 7.6 candies. Construct a 95% confidence interval for the mean number of candies contained in all packages of this candy.

5) Six artichoke plants at a farm were selected at random. Here are the number of artichokes produced by each plant last year.

32	17	51	40	36	34

Construct a 99% confidence interval for the mean number of artichokes produced by all artichoke plants.

6) The Dean of Registration at a community college has implemented a new telephone registration system. The company that sold the system to the college claims that the mean length of phone calls is less than 10 minutes. To check this, the Dean randomly selected 20 calls, and these calls had a mean length of 7.1 minutes and a standard deviation of 1.89 minutes.

a) Construct a 95% confidence interval for the mean length of all phone calls using this system.

b) Is the company's claim consistent with your interval? Explain your answer in your own words.