Theory Recap

- A numerical measure of a population is known as population parameter
  - This uses ALL the values of a population
- A numerical descriptive measure of a sample is known as sample statistic
  - Found in calculations using observations from experiments
- The probability distribution of the statistics constructed from many samples of the same size is known as the sampling distribution

	Population Parameter	Sample Statistic
Mean	μ	$\bar{x}$
Median	η	M or Q_2
Variance	σ^2	s^2
Standard Deviation	σ	s
Binomial Proportion	p	$\hat{p}$

- A number that is calculated from a sample to estimate the target parameter is known as the Point Estimate
- The interval of numbers calculated from a sample that contains the target parameter is known as the Confidence Interval
- The probability that the estimation method will generate a Confidence Interval is known as the Confidence Level
  - The most common values used are: 99%, 95%, 90%
- The complement of the Confidence Level is known as the Type I Error (α)
  - To find this, we use: $\alpha = 1 - (\text{Confident Level})$
  - The most common values used are: 1%, 5%, 10%
  - If you are not given one in the question, we assume that it is 5%

95% Confidence Level ↗

- The overall formula for finding Confidence Interval is...

(Point Estimate - Margin of Error, Point Estimate + Margin of Error)

Population Mean Theory

- The way we solve for the confidence interval depends on the sample size.
  - Considered __large__ if the total (n) is __$n \geq 30$__ and __small__ if the total (n) is __$n < 30$__.
- Formulas to understand:
  - Point Estimate (For large and small sizes)

$$PE = \bar{x} = \frac{\Sigma x}{n}$$

  - Margin of Error
    - For large samples

$$MOE = z_{\alpha/2} \frac{s}{\sqrt{n}}$$

    - For small samples

$$MOE = t_{\alpha/2} \frac{s}{\sqrt{n}}$$

  - Critical Value
    - For large samples ($z_{\alpha/2}$)

$$z_{\alpha/2} = \left| invNorm\left(\frac{\alpha}{2}, \mu, \sigma\right) \right|$$

    - For small samples ($t_{\alpha/2}$)

$$t_{\alpha/2} = \left| invT\left(\frac{\alpha}{2}, df\right) \right|$$

- T-distribution
  - Very similar to normal distribution except it works with a __family or multiple of distributions__ instead of a single distribution.
  - Uses __degrees of freedom__
    - $df = n - 1$
- Interpretation

We are __%__ confidence that the true unknown population mean lies in the interval (solved confidence interval).

- Calculator Tricks for Population Mean C.I.
  - For large samples
    - ZInterval

    Stat --> Tests --> 7: ZInterval

  - For small samples
    - TInterval

    Stat --> Tests --> TInterval

  - Regardless of which trick you have to use, there are two paths in using the function:
    - Data
      - Use lists after the data is entered into the calculator
      - Also need the confidence level
    - Stats
      - Need: mean (μ), standard deviation (σ), and sample size (n)
      - Also need the confidence level