AP Statistics – 8.3a (revised 2020)	Name: 2020 KEY
Goal: Introduction to CI for Means and calculating sample size	Date:

I. **Means versus Proportions**: In your own words describe how you tell whether the problem is based on means or proportions:

Proportions – %'s (Categorical Variables)

Means - Averages (QUANTITATIVE VARIABLES)

II. Introduction to Confidence Intervals for Means

1) What are the **3 CONDITIONS** that must be checked before finding a CI **for means**?
   1) RANDOM
   2) INDEPENDENT – 10% CONDITION ← REQ'D TO CALC. S.D.
   3) NORMAL
      - EITHER → Population is NORMAL
      - → CLT $n \geq 30$

2) **CENTER**: What would you expect the point estimator would be for population means?

$\bar{x}$ (Sample statistic)

3) **SPREAD:**
   - What is the **Standard Deviation** for the sampling distribution for $\bar{x}$?

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Locate on Green sheet

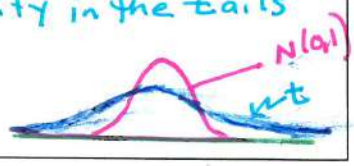
   - We never know the population standard deviation, so we replace **σ** with s_x. This is called the **Standard Error** and the formula is on your green sheet:

$$SE(\bar{x}) = \frac{s_x}{\sqrt{n}}$$

4) **Introduction to a new test statistic used for the Critical Value for Population Means:**
   - In most real world problems, we do NOT know the population MEAN (μ) or POPULATION STANDARD DEVIATION (σ), therefore we cannot use the Z-statistic for inference for means.
   - In Section 8.3, you will be introduced to a new test statistic used for inference tests with means called the **t-Statistic.** MEANS ALWAYS USE T-statistic for CI's and Inference.
   - Continue on back

Let's explore **the t-distribution vs. the normal distribution** using https://www.geogebra.org/m/y3UPKHuH

How are "t" & Normal similar?	How are their spreads different?	What happens to "t" when "n" increases?
Both • Symmetric • Single peak • Mean at "0"	"t" more spread out wider than Normal	Approaches the Normal Distribution

How many different distributions for "t" vs. Normal?	What is the differences in tails between "t" vs. Normal?
t: ∞ distribs, $df = n-1$ VS. Normal: 1 → N(0,1)	"t" has more probility in the tails and less in center compared to Normal 

III. Sample Sizes for Means Examples:

The formula to calculate the sample size for means is:

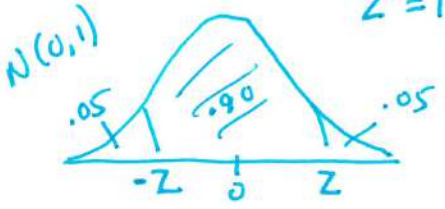
WE WILL BE TOLD: CL, ME, and σ $\Rightarrow$ $ME \geq z^*\left(\frac{\sigma}{\sqrt{n}}\right)$ $\Leftarrow$ SOLVE FOR "n" ALWAYS ROUND UP!

Example: How much homework? Administrators at your school want to estimate how much time students spend on homework, on average, during a typical week. They want to estimate μ at the 90% confidence level with a margin of error of at most 30 minutes. A pilot study indicated that the standard deviation of time spent on homework per week is about 154 minutes. How many students need to be surveyed to estimate the mean number of minutes spent on homework per week with 90% confidence and a margin of error of at most 30 minutes?

$CL = 90\%$ $ME = 30 MIN$

$\sigma = 154 MIN$

$z^* = 1.645$



$30 \geq 1.645 \cdot \frac{154}{\sqrt{n}}$

$\sqrt{n} \geq \frac{(1.645)(154)}{30}$

$(\sqrt{n})^2 \geq (8.44)^2$

$\boxed{n \geq 71.307}$

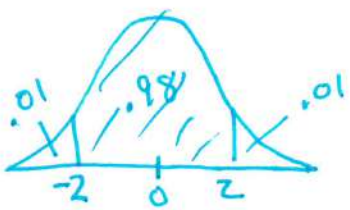
THE ADMINISTRATORS NEED TO SURVEY AT LEAST 72 STUDENTS

CYU on page 501:

$CL = 98\%$ $ME = 0.0001$

$\sigma = 0.0002$

$z^* = 2.33$



$0.0001 \geq 2.33\left(\frac{0.0002}{\sqrt{n}}\right)$

$\sqrt{n} \geq \frac{(2.33)(0.002)}{.0001} = 4.66$

$\boxed{n \geq 21.72}$

The minimum sample size is 22 measurements.