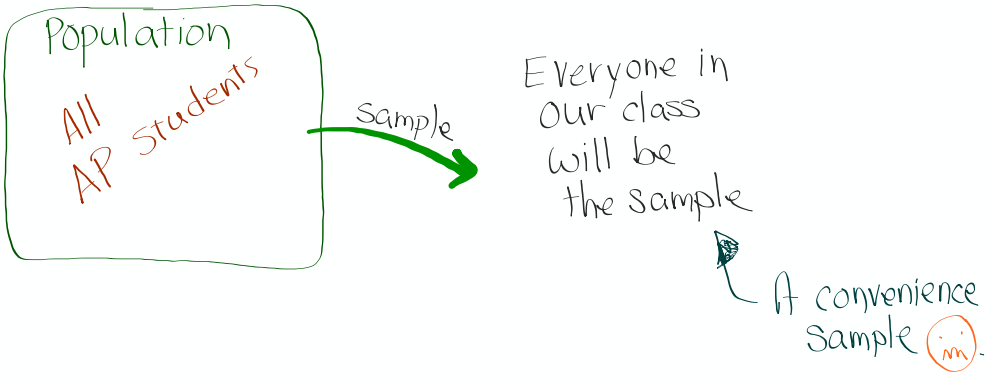
CONSTRUCT and INTERPRET a confidence interval for a population mean.

DETERMINE the sample size required to obtain a specified confidence interval for a population mean with a specified margin of error.

We're about to collect data for 60 seconds



Need scratch paper.

When I say go ...

Write down as many of the 50 U.S. states as you can in 60 seconds

Lesson 8.3: Day 2: **How many states can you name?**

How many states can you name in one minute? We will use this class as a random sample of all AP Stats students to estimate a 95% confidence interval for the mean number of states an AP Stats student can name in one minute.

1. When the timer starts, list as many states as you can on a piece of paper. Write the number of states you listed on the board.

   What type of data is this? Categorical or quantitative?

2. Enter the class data at stapplet.com or use your GDC. Find the sample mean and standard deviation. Sketch the dotplot of the sample data.

$n =$ $\bar{x} =$ $s_x =$

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How many states can you name in one minute? We will use this class as a random sample of all AP Stats students to estimate a 95% confidence interval for the mean number of states an AP Stats student can name in one minute.

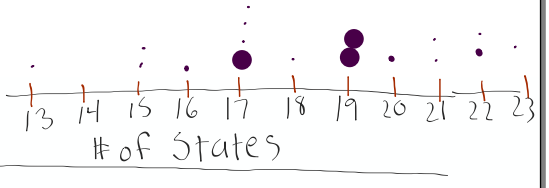
1. When the timer starts, list as many states as you can on a piece of paper. Write the number of states you listed on the board.

   What type of data is this? Categorical or quantitative?

   Quantitative → means
   Categorical → proportions

2. Enter the class data at stapplet.com or use your GDC. Find the sample mean and standard deviation. Sketch the dotplot of the sample data.

$n =$ 17 $\bar{x} =$ 18.35 $s_x =$ 2.85



3. Construct a 95% confidence interval to estimate the mean # of states a senior can name.

STATE: State the parameter you want to estimate and the confidence level.

Parameter: _____ Confidence level: _____

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure:

Check the 3 conditions:

3. Construct a 95% confidence interval to estimate the mean # of states a senior can name.

STATE: State the parameter you want to estimate and the confidence level.

Parameter: μ = true mean of # of states Confidence level: 95%

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure: One Sample t interval for μ

Check the 3 conditions:

① Random ③ Normal

② 10%

3. Construct a 95% confidence interval to estimate the mean # of states a senior can name.

STATE: State the parameter you want to estimate and the confidence level.

Parameter: μ = true mean of # of states Confidence level: 95%

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure: One Sample t interval for μ

Check the 3 conditions:

① Random - Assumed ③ Normal

~~$n > 30$ CLT~~

OR

Sample shows no strong skew or outliers.

② 10% $n < \frac{1}{10}$(all AP students)

When Assessing Normality

It's not enough just to view a graph on your calculator.

You must make a quick sketch of the graph for full credit.

DO: If the conditions are met, perform the calculations.

General Formula for any confidence interval:

Specific Formula for this confidence interval:

Plug numbers into the formula:

Answer:

CONCLUDE: Interpret your interval in the context of the problem.

Interpret:

DO: If the conditions are met, perform the calculations.

General Formula for any confidence interval: Point Est ± Margin of Error

Specific Formula for this confidence interval: $\bar{x} \pm t^* \cdot \frac{s_x}{\sqrt{n}}$

$t^* = 2.120$

$df = 17-1 = 16$

.025 .95 .025

Plug numbers into the formula: $18.35 \pm 2.120 \cdot \frac{2.85}{\sqrt{17}}$

Answer: 18.35 ± 1.47

$(16.88, 19.82)$

CONCLUDE: Interpret your interval in the context of the problem.

Interpret: We are 95% confident that the interval from 16.88 to 19.82 captures the true mean of the #states written in 60 sec. by an AP student.

Construct confidence intervals for a population proportion with a TI-83 or a TI-84.

good for

a) multiple choice questions

b) checking work on Free Response

One Sample t interval for μ

↑ mean

$\bar{x}$ =

S_x =

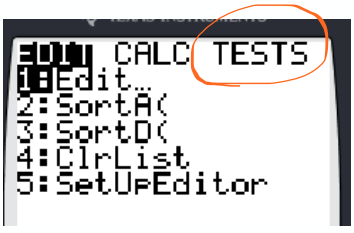
n=

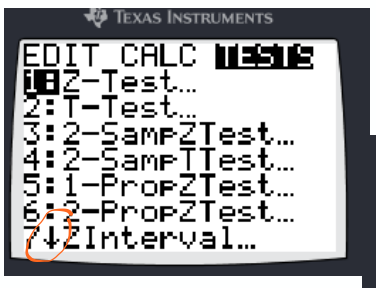
95% Conf. level

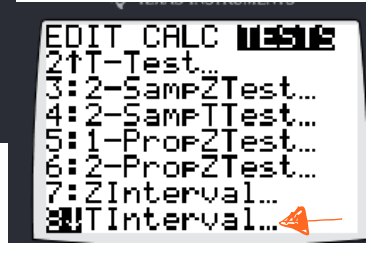
One Sample t interval for μ

↑ mean

STAT







CHOOSING THE SAMPLE SIZE

A wise user of statistics never plans data collection without thinking about the analysis at the same time. You can arrange to have both high confidence and a small margin of error by taking enough observations.

The formula for the margin of error (*ME*) in the confidence interval for μ is

$$ME = t^* \frac{s_x}{\sqrt{n}}$$

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$$ME = t^* \frac{s_x}{\sqrt{n}}$$

There are two problems:

1. We don't know the sample standard deviation s_x because we haven't produced the data yet.

2. The critical value t^* depends on the sample size n that we choose.

Therefore, come up with a reasonable estimate for the population standard deviation σ from a similar study that was done in the past or from a small-scale pilot study.

By pretending that σ is known, we can use the margin of error in the one-sample z interval for μ:

$$ME = z^* \frac{\sigma}{\sqrt{n}}$$

Sample Size for Desired Margin of Error when Estimating μ

To determine the sample size *n* that will yield a C% confidence interval for a population mean with a specified margin of error *ME*:

- Get a reasonable value for the population standard deviation s from an earlier or pilot study.
- Find the critical value z^* from a standard Normal curve for confidence level C.
- Set the expression for the margin of error to be less than or equal to *ME* and solve for *n*:

$$z^* \frac{\sigma}{\sqrt{n}} \leq ME$$

Important: Sample Size

for sample mean

Margin of Error $t^* \cdot \frac{s_x}{\sqrt{n}}$

but use z^* in place of t^* if it's unknown

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 meet the administrators' goal?

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

z^* for 90% conf. level

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

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

z^* for 90% conf. level

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

$$\left(\sqrt{n}\right)^2 = \left(\frac{1.645 \cdot 154}{30}\right)^2$$

$n = 71.31$ round up

72 students

CAUTION:

Although we assumed a value for the population standard deviation σ to calculate the required sample size, you should not assume a value for σ when calculating **a confidence interval** for μ.

Ch. 8 Formula Study Sheet

AP Stats Chapter 8 Formula Study Sheet

	8.2	8.3
What are we trying to estimate?		
Symbol for statistic		
Symbol for parameter		
Name of the procedure		
RANDOM condition		
10% Condition		

AP Stats Chapter 8 Formula Study Sheet

	8.2	8.3
What are we trying to estimate?	proportion	mean
Symbol for statistic	$\hat{p}$	$\bar{x}$
Symbol for parameter	p	μ
Name of the procedure	one 1 sample z interval for p	1 sample t interval for μ
RANDOM condition	"SRS" random sample	"SRS" random sample
10% Condition	$n < \frac{1}{10}$ population	$n < \frac{1}{10}$ of popul●

$n < .1N$

NORMAL condition		
Formula for standard error		
***z* or t**?**		
Formula for margin of error		
General formula for confidence interval		
Specific formula for confidence interval		

NORMAL condition	Large Counts $n\hat{p} \geq 10$ $n(1-\hat{p}) \geq 10$	a) Pop is approx normal b) $n \geq 30$ CLT c) sample has no strong skewness or outliers
Formula for standard error	$SE_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	$SE_{\bar{x}} = \frac{s_x}{\sqrt{n}}$
***z* or t**?**	z^*	t^* use $df = n-1$
Formula for margin of error	$z^* \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	$t^* \cdot \frac{s_x}{\sqrt{n}}$
General formula for confidence interval	Point Est ± Marg. of Error	Pt Estim ± Marg of Error
Specific formula for confidence interval	$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	$\bar{x} + t^* \cdot \frac{s_x}{\sqrt{n}}$

Calculator → 1 Prop z Int 1 T Interval

Four Step Process

STATE: State the parameter you want to estimate and the confidence level.

PLAN: Identify the appropriate inference method and check conditions.

DO: If the conditions are met, perform the calculations.

Include: General Formula + Specific Formula + Plug numbers into the formula + answer

CONCLUDE: Interpret your interval in the context of the problem.

Time to check you on the full process

on estimating the mean of a population using confidence intervals

1. Work in pairs with partners assigned (by the alphabet)
2. Try NOT to use the Ch.8 Study Sheet but use it only if needed.
3. I will be assigning pairs to write portions of the solutions on the board.
4. Use the TI-Interval APP only to check answers.

8.3.....69, 73, 77, 81-84

and study pp. 534-540