Statistics
Fall 2022
Lecture 26

Given $128 < \mu < 150$

1) Find the point-estimate $\bar{x}$.

$\bar{x} = \frac{150+128}{2} = \frac{278}{2} = \boxed{139}$

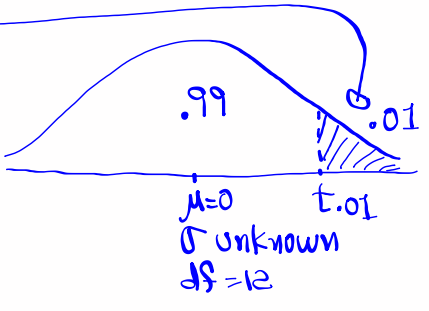
2) Find the margin of error E.

$E = \frac{150-128}{2} = \frac{22}{2} = \boxed{11}$

Find $t_{.01}$ with $df = 12$.

$t_{.01} = invT(.99, 12)$

$= \boxed{2.681}$



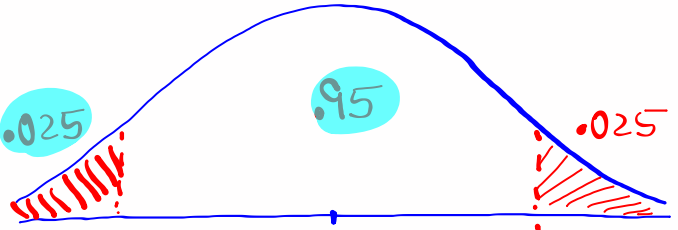
Find $t_{\alpha/2}$ for 95% C-level with df = 19.

Middle Area = .95

$1-\alpha = .95$

$\alpha = .05$

$\alpha/2 = .025$



$t_{.025} = invT(.975, 19)$

$= 2.093$

Given: $n = 25$ $\bar{x} = 48.5$, $\sigma = 7.5$,

Find 98% Conf. interval for pop. mean.

σ known $\Rightarrow$ Z Interval

σ unknown $\Rightarrow$ T Interval

$45.0 < \mu < 52.0$

$\bar{x} = \frac{52+45}{2} = 48.5$

$E = \frac{52-45}{2} = 3.5$

Given: $n = 8$ $\bar{x} = 6.48$ $S = 0.75$

Find 90% conf. interval for the pop. mean.

σ known $\Rightarrow$ Z Interval

σ unknown $\Rightarrow$ T Interval

$5.98 < \mu < 6.98$

$\bar{x} = \frac{t}{2}$

$E = \frac{6.98 - 5.98}{2} = \boxed{.5}$

I randomly selected 8 days, and here are my blood sugar level in those days

125	132	140	100
120	130	110	145

Find

1) $\bar{x} = 125.25$
2) $S = 14.993$

} Round to whole # $\Rightarrow$ $\bar{x} = 125$, $\boxed{S = 15}$

Find conf. interval for the mean of all my blood sugar levels.

↳ NO C-level $\Rightarrow$ use .95

σ unknown $\Rightarrow$ T Interval

$112 < \mu < 138$

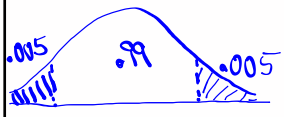
$E = \frac{138 - 112}{2} = \boxed{13}$

Find min. sample size needed for the last example if I wish to construct 99% Conf. interval and margin of error not to exceed 10.

$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$

$s = 15$

When σ is unknown, use s instead.



$z_{.005} = \text{invNorm}(.995, 0, 1) = 2.576$

$n = \left(\frac{2.576 \cdot 15}{10}\right)^2 = 14.930$

$n = 15$

Repeat if $E = 5$

$n = \left(\frac{2.576 \cdot 15}{5}\right)^2 = 59.722$

$n = 60$

SG 23

Testing claims: SG 24-27

claim could be made about any parameters.

- Population Proportion p
- Population Mean μ
- Population standard deviation σ

Purpose of Testing:

It is to determine the validity of a claim at some significance level.

Final Conclusion:

Reject the claim when claim is invalid

Fail-to-Reject the claim when claim is valid.

Support the claim

Possible error:

when claim is valid but we reject it.

when claim is invalid but we support it.

Final Conclusion:

Reject the claim (when claim is invalid)

OR

Fail-to-Reject the claim (when claim is valid)

Testing Methods:

- Traditional Method
- P-Value Method

we use these methods in class.

- Confidence Interval Method

Regardless of methods used to perform testing final conclusion must be the same.

Reject the claim when claim is invalid **OR FTR the claim** when claim is valid

Testing Types:

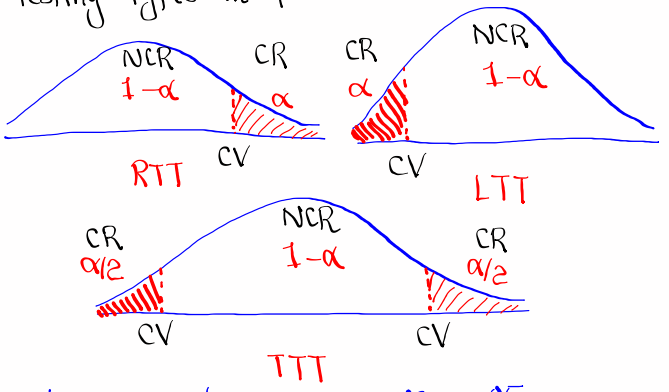
- Right-Tail Test (RTT)
- Left-Tail Test (LTT)
- Two-Tail Test (TTT)

Every testing comes with Significance level α.

$0 < \alpha < 1$

when α not given $\Rightarrow$ use .05

Testing Types in Pictures:



when α not given $\Rightarrow$ use .05

Testing Process:

1) Set-up H_0 & H_1 — Alternative Hypothesis } H_a

Null Hypothesis

H_0 must contain = Sign

$=, \geq, \leq$

H_1 cannot contain = Sign

$\neq, <, >$

Keywords:

H_0 ⇒ is, equal, same, at least, at most, ...

H_1 ⇒ is not, not equal, different, more than, less than, below, above, exceed, ...

Always identify the claim, and type of test.

Claim could be H_0 or H_1 but not both at the same time.

② Find all Critical Values

Drawing, labeling, shading, full TI Command required.

③ Find Computed-Test statistic (CTS) and P-Value.

Full TI Command or formula required.

④ Use Testing Chart to determine the validity of H_0 & H_1.

H_0 Valid ⟺ H_1 invalid

H_0 invalid ⟺ H_1 Valid

5) Final Conclusion must be about the claim.

Reject the claim OR FTR the claim

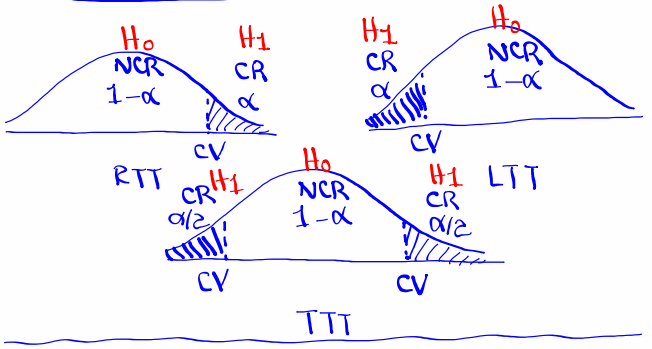
More on H_0 & H_1:

H_0: $=$ H_1: $\neq$ TTT

H_0: $\geq$ H_1: $<$ LTT

H_0: $\leq$ H_1: $>$ RTT

H_1 tells us what type of testing to do.



$P(H_0 \text{ is valid}) = 1-\alpha = P(H_1 \text{ is invalid})$

$P(H_0 \text{ is invalid}) = \alpha = P(H_1 \text{ is valid})$

Ex. 1: I claim 10% of all students smoke. $\rightarrow p = .1$

H_0: $p = .1$ claim

H_1: $p \neq .1$ TTT

Ex. 2: I claim the mean age of all students is at most 32 years. $\mu \leq 32$

H_0: $\mu \leq 32$ claim

H_1: $\mu > 32$ RTT

I claim standard deviation of salaries of all nurses is below \$500. < 500

H_0: $\sigma \geq 500$

H_1: $\sigma < 500$ claim, LTT

College bookstore claims the mean cost of all new textbooks is not $125.

$\mu \neq 125$

H_0: $\mu = 125$

H_1: $\mu \neq 125$ claim, TTT

Possible errors

Reject a valid claim

Support an invalid claim

Four-Possible Outcomes for H_0:

Reality / Conclusion	H_0 Valid	H_0 invalid
Support H_0	Correct Decision	Type II error
Reject H_0	Type I error	Correct Decision

$P(H_0 \text{ valid}) = 1 - \alpha = P(H_1 \text{ invalid})$

$P(H_0 \text{ invalid}) = \alpha = P(H_1 \text{ valid})$

You can do Page 1-3, and Part of Page 4 of SG 24.