Statistics

Lecture 19

Feb 19-8:47 AM

Testing Claims:

SG 23

A claim is made, our task is to determine whether claim is valid or not.

If claim is valid, then we support it.

If claim is invalid, then we reject it.

Possible errors:

Claim is valid but we reject it.

Claim is invalid but we support it.

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Claim could be made about any parameter.

It could be about

1) Population Proportion p
2) Population Mean μ
3) Population Standard deviation σ
4) ....

with any testing, there is a level of Significance α

$0 < \alpha < 1$

When α not given, we use .05

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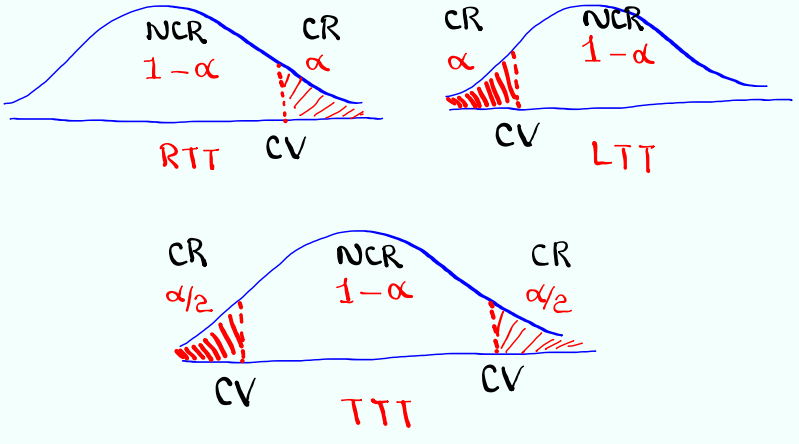
Testing Types:

1) Right-Tail Test RTT
2) Left-Tail Test LTT
3) Two-Tail Test TTT



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Testing Methods:

1) Traditional Method
2) P-Value Method
3) Confidence Interval Method

Regardless of the method, the conclusion must be the Same.

when claim is valid → we Support it.

when claim is invalid → we reject it.

Final Conclusion: Support

Reject the claim OR Fail-to-Reject the claim

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Testing Process

1) Set-up H_0 and H_1. ← Alternative Hypothesis H_a
   ↑ Null Hypothesis

2) find Critical Value(s).
   Drawing, labeling, shading, and full TI Command required.

3) find Computed Test Statistic CTS and P-Value P.
   Formula or TI Command required.

4) Use Testing Chart to determine the validity of H_0 and H_1.
   H_0 valid ⟷ H_1 invalid
   H_0 invalid ⟷ H_1 valid

5) Draw final Conclusion about the claim.
   claim could be H_0 or H_1 but not both at the same time.

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More on H_0 & H_1:

H_0 must contain the = Sign. $=, \geq, \leq$

H_1 Cannot contain the = Sign. $\neq, <, >$

Keywords for H_0:

is, equal, same, atleast, at most, ...

Keywords for H_1:

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

H_0: $=$	H_0: $\geq$	H_0: $\leq$
H_1: $\neq$	H_1: $<$	H_1: $>$
TTT	LTT	RTT

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CNN claims that 70% of all students have iPhone

$p = .7$ claim

H_0

H_0: $p = .7$ claim

H_1: $p \neq .7$ TTT

LA Times claims that the mean age of all nurses in So. Cal. is below 45 Yrs.

$\mu < 45$ claim

H_1

H_0: $\mu \geq 45$

H_1: $\mu < 45$ claim, LTT

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The dept claims that Standard deviation of all exam Scores is at most 10.

$\sigma \leq 10$ claim

H_0

$H_0: \sigma \leq 10$ claim

$H_1: \sigma > 10$ RTT

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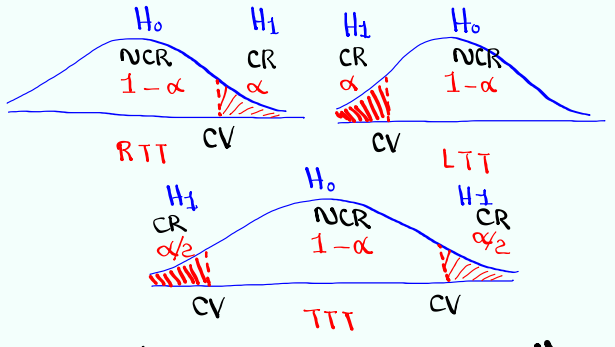

$P(H_0 \text{ valid}) = P(H_1 \text{ invalid})$

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

Four-Possible outcomes For H_0:

Conclusion \ Reality	H_0 Valid	H_0 invalid
Support H_0	Good Decision	Type II error
Reject H_0	Type I error	Good Decision

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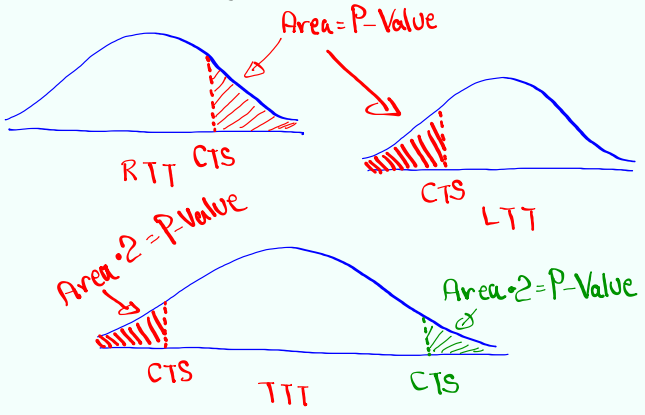
what is P-Value?

P-Value is the area of the tail of graph of the dist. marked by CTS.

CTS → Computed Test Statistic

Multiply that area by 2 when Performing only TTT.



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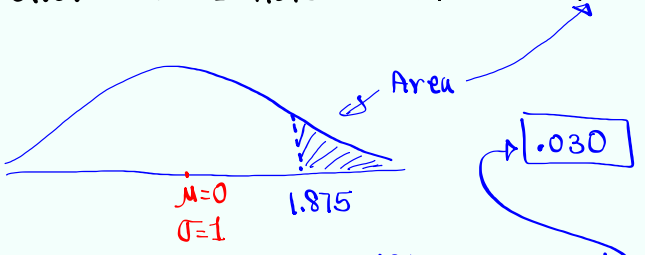
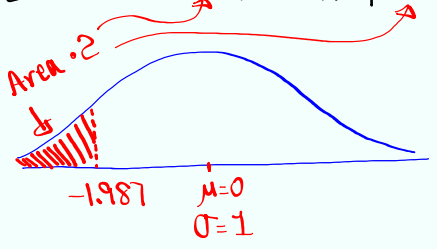
Given CTS $Z = 1.875$ RTT Find P-Value.



P-Value = normalcdf(1.875, E99, 0, 1) =

Given CTS $Z = -1.987$ TTT Find p-value.



P-Value = 2 · normalcdf(−E99, −1.987, 0, 1)

= .047

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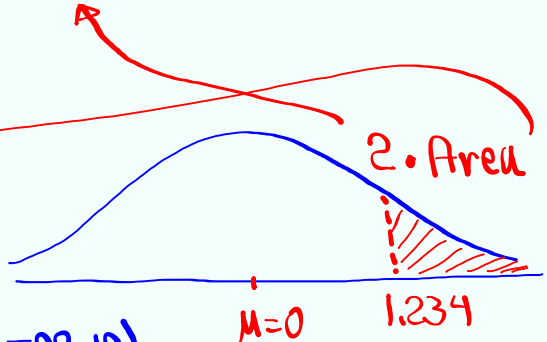
CTS $t = 1.234$ TTT $df = 19$

find P-value.



$P\text{-Value} = 2 \cdot tcdf(1.234, E99, 19)$

$= \boxed{.232}$

$\mu = 0$
σ unknown
$df = 19$

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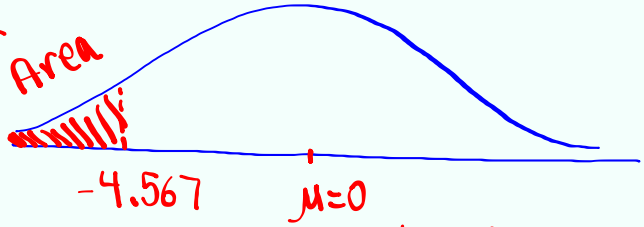
CTS $t = -4.567$ LTT $df = 24$

find p-value.



$P\text{-Value} = tcdf(-E99, -4.567, 24)$

$= \boxed{6.2 \times 10^{-5}}$

$\mu = 0$
σ unknown
$df = 24$

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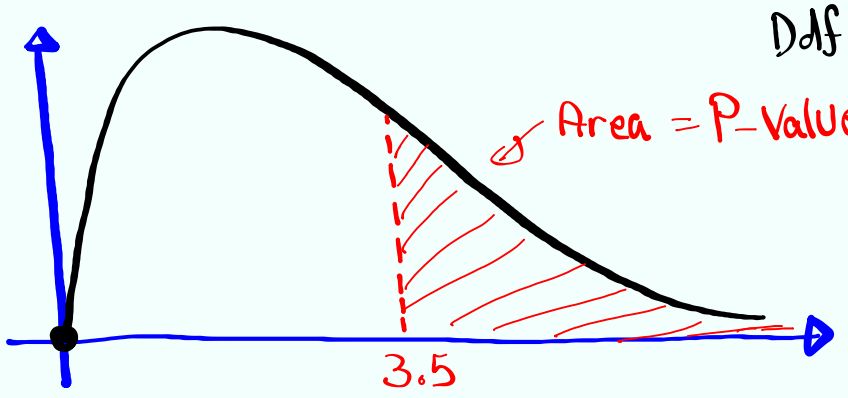
Given CTS F = 3.5 RTT Ndf = 4
Ddf = 10



P-Value = fcdf(3.5, E99, 4, 10) = .049
L U Ndf Ddf

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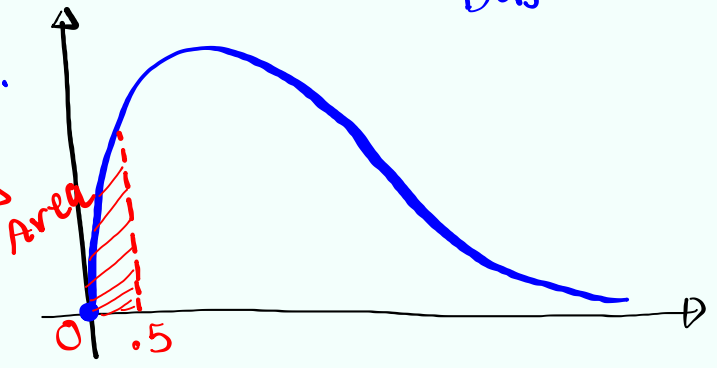
Given CTS F = .5, LTT, Ndf = 6
Ddf = 6

find p-value.



P-Value = fcdf(0, .5, 6, 6) = .210

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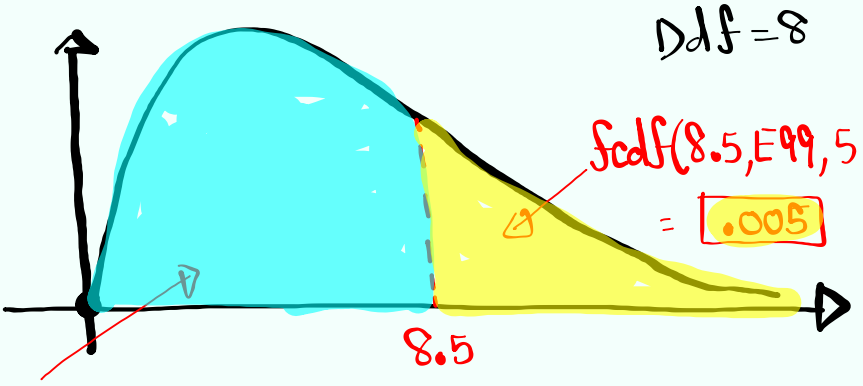
Given CTS F=8.5 TTT ndf=5 Ddf=8



fcdf(0,8.5,5,8) = .995

P-Value = 2 · Smaller area

= 2(.005) = .010

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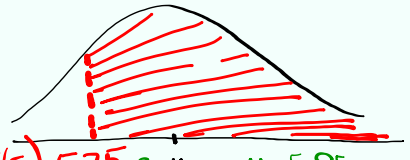
Gas Prices are normally dist. with the mean of $5.85 and standard deviation of $.45. N(5.85, .45)

If we randomly select n=3 gas stations, find the prob. that their mean $\bar{x}$ gas price is more that $5.75.

$P(\bar{x} > 5.75)$



= normalcdf(5.75, E99, 5.85, .45/√3)

5.75

CLT $\mu_{\bar{x}} = \mu = 5.85$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{.45}{\sqrt{3}}$

≈ .650

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I flipped a fair coin 1600 times.

Success is to land tails.

$n=1600$

$p=.5$

$q=.5$

Find usual Range for # of tails.

95% Range $\rightarrow \mu \pm 2\sigma$

$800 \pm 2(20)$

$\mu = np$

$\sigma^2 = npq$

$\sigma = \sqrt{\sigma^2}$

$\mu = 1600(.5) = 800$

$\sigma^2 = 1600(.5)(.5) = 400$

$\sigma = \sqrt{\sigma^2} = \sqrt{400} = 20$

760 to 840

P(# tails is between 760 & 840, inclusive)

$P(760 \le x \le 840) = \text{binomcdf}(1600, .5, 840) -$

$\text{binomcdf}(160, .5, 759) =$ .957

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x	y
5	82
6	85
7	80
7	90
9	95
10	90

L1 L2

Find

1) $a = 71.346 \approx 71$

2) $b = 2.135 \approx 2$

$\rightarrow y \approx 71 + 2x$

3) $r^2 \approx 49\%$

LinReg(a+bx)

4) $r = .703$

Predict y if $x = 8$ assume

1) r is Significant

$y = 71 + 2x$

$= 71 + 2(8)$

$= 71 + 16$

$= 87$

2) r is not Sig.

use $\bar{y}$

$\bar{y}$ 87

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