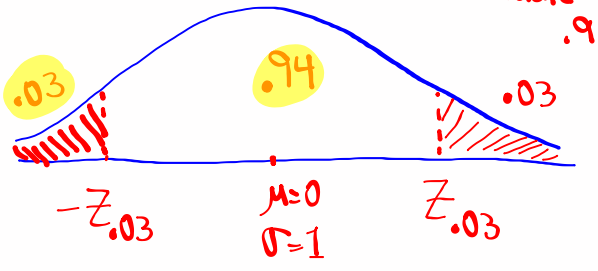
Statistics
Fall 2022
Lecture 12

Feb 19-8:47 AM

Find $z_{\alpha/2}$ for 94% Conf. level.

Middle Area .94



$1 - .94 = .06$ ↑ α

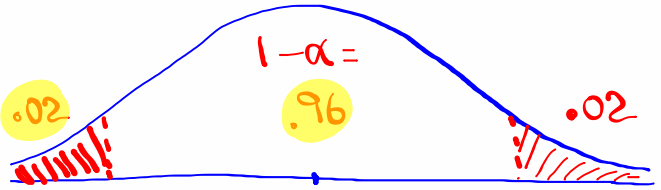
$.06 \div 2 = .03$ ↑ $\alpha/2$

$z_{.03} = \text{invNorm}(.97, 0, 1) = 1.881$

Nov 15-6:51 PM

Find $t_{\alpha/2}$ for $\alpha = .04$ with $df = 18$.

$\alpha/2 = .04/2 = .02$



$= \boxed{2.214}$

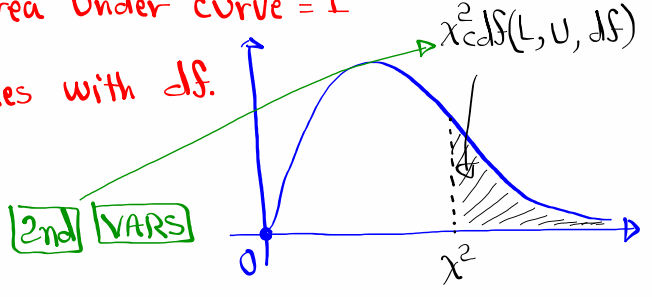
Nov 15-6:56 PM

Chi-Square dist.: χ^2

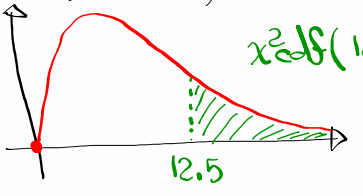
Graph begins at 0, and skewed to the right

Total area under curve = 1

It comes with df.



Find $P(\chi^2 > 12.5)$ with $df = 9$.



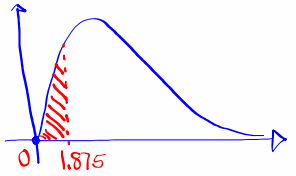
$\chi^2cdf(12.5, E99, 9) = \boxed{.187}$

Nov 15-7:00 PM

Find $P(\chi^2 < 1.875)$ with $df = 14$.

$\chi^2cdf(0, 1.875, 14)$

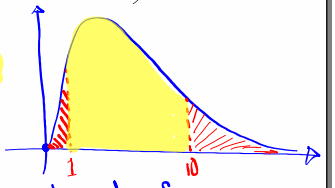
$= 5.6 \times 10^{-5}$



Find $P(\chi^2 < 1$ OR $\chi^2 > 10)$ with $df = 7$.

$= 1 - \chi^2cdf(1, 10, 7)$

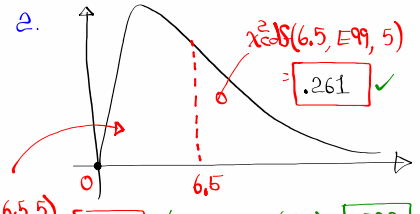
$= .194$



Find the area on each side of $\chi^2 = 6.5$ with $df = 5$, then multiply the smaller area by 2.

$\chi^2cdf(6.5, E99, 5)$

$= .261$ ✓



$\chi^2cdf(0, 6.5, 5)$ $= .739$ ✓

$2 * (.261) = .522$

Nov 15-7:05 PM

F-Dist.

Graph is similar to χ^2-Dist.

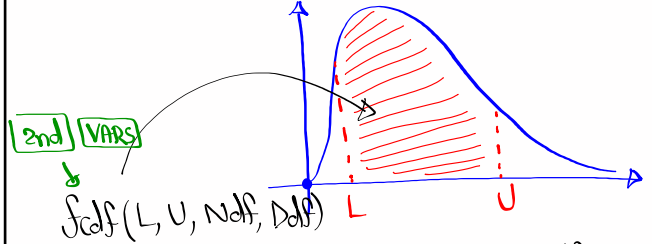
Total area under curve = 1

It comes with two degrees of freedom:

Numerator df → Ndf

Denominator df → Ddf.

2nd VARS

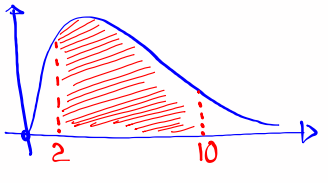


$Fcdf(L, U, Ndf, Ddf)$

Find $P(2 < F < 10)$ with $Ndf = 4$ & $Ddf = 21$

$Fcdf(2, 10, 4, 21)$

$= .131$



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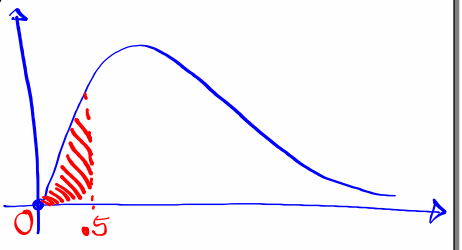
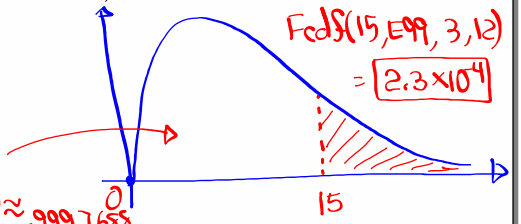
Find $P(F<.5)$ with Ndf = 4, Ddf = 10.



$\text{Fcdf}(0, .5, 4, 10) = .263$

Given Ndf = 3, Ddf = 12, find the area on each side of F = 15, then multiply the smaller area by 2.



$\text{Fcdf}(15, E99, 3, 12) = 2.3 \times 10^{-4}$

$\text{Fcdf}(0, 15, 3, 12) \approx .9997688 \approx 1$

$2 * 2.3 \times 10^{-4} = 4.6 \times 10^{-4}$

Nov 15-7:21 PM

Class QZ 12

Find 98% conf. interval for pop. mean given $n = 18$, $\bar{x} = 148$, and $S = 15$. Give margin of error.

$\bar{x}$: Point-estimate

C-level: .98

σ unknown → T Interval

$138.92 < \mu < 157.08$

$139 < \mu < 157$

$E = \frac{157 - 139}{2} = 9$

Nov 15-7:30 PM

Testing claims: SG 24-27

Claim could be about any Parameters.

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

Why are we testing?

It is to determine the validity of the claim.

Final Conclusion:

Reject the claim when claim is invalid

OR

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

Support

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Possible Error:

when claim is valid but we reject it.

when claim is invalid but we support it.

Testing Methods:

- Traditional Method } We use these 2 methods for this class
- P-Value Method }
- Confidence Interval Method

Regardless of the method used for testing,

Final Conclusion is the Same.

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

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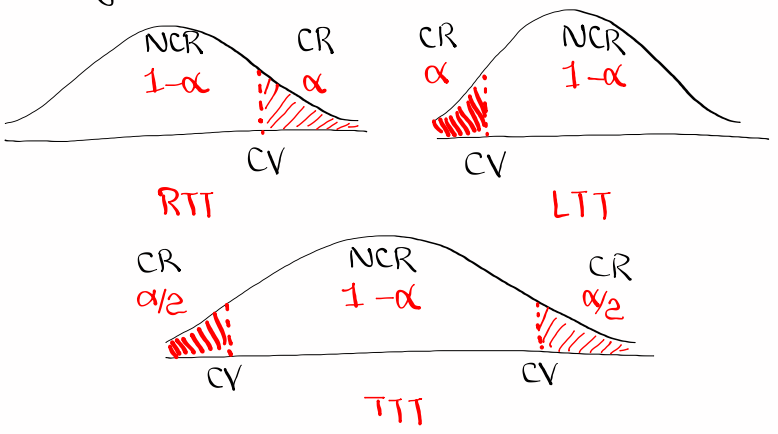
Testing Types:

- 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, use .05

Testing Types in Picture:



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Testing Process:

1) Set-up H_0 & H_1 — Alternative Hypothesis

H_0: Null Hypothesis

H_0 must contain = Sign

$=, \geq, \leq$

H_1 can not have = Sign.

$\neq, <, >$

Key words:

H_0: is, equal, Same, at least, at most, ...

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

Always identify the claim, and testing type.

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

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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 $\Leftrightarrow$ H_1 invalid
H_0 invalid $\Leftrightarrow$ H_1 valid

5) Final Conclusion must be made about the claim.
Reject the claim OR FTR the claim

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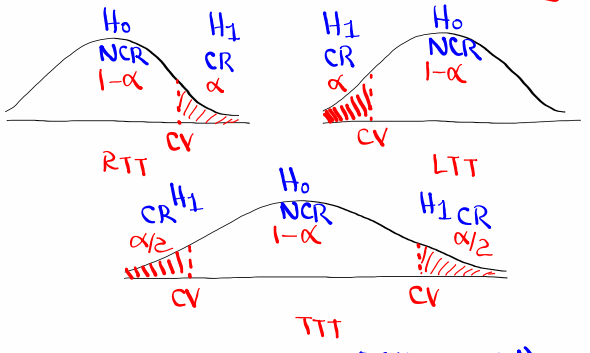
More on H_0 & H_1:

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.



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

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

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Ex: 1 I claim 5% of all students are left-handed.

$H_0: P = .05$ claim

$H_1: P \neq .05$ TTT

Ex: 2 I claim the mean age of all students is at most 30 yrs. (≤ 30)

$H_0: \mu \leq 30$ claim

$H_1: \mu > 30$ RTT

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Ex: 3 I claim standard deviation of salaries of all teachers is below \$400 (< 400)

$H_0: \sigma \geq 400$

$H_1: \sigma < 400$ claim, LTT

College bookstore claims the mean price of all textbooks is not \$100 ($\neq 100$)

$H_0: \mu = 100$

$H_1: \mu \neq 100$ claim, TTT

Possible errors:

Reject a valid claim

Support an invalid claim

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Four - Possible outcomes for H_0:

Conclusion \ Reality	H_0 valid	H_0 invalid
Support H_0	Correct Decision	Type II error
Reject H_0	Type I error	Correct Decision

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What is P-value?

P-value is the area of the tail marked by CTS (Computed-Test statistic)

Multiply by 2 only if it is a TTT.

Ex: CTS $Z=1.825$, RTT, find P-value.

Area = P-value
= normalcdf(1.825, E99, 0, 1)
= .034

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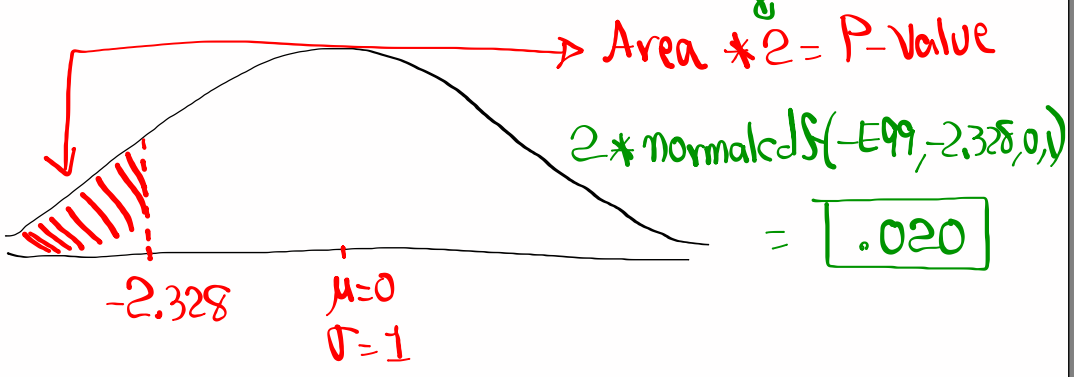
Ex: CTS $Z = -2.328$, TTT, find P-value.



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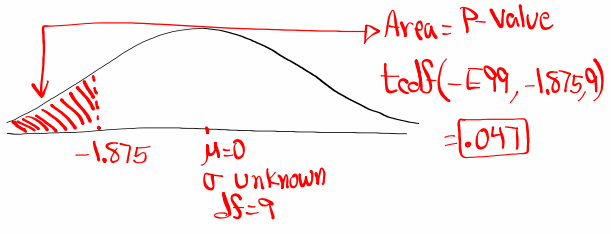
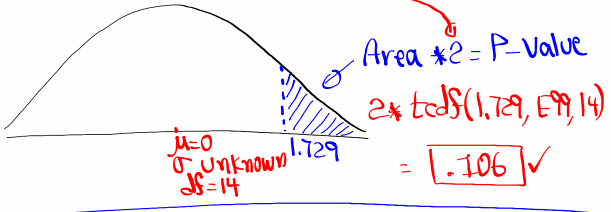
Given CTS $t = -1.875$, LTT, $df = 9$.



CTS $t = 1.729$, TTT, $df = 14$, find P-value.



It is very important to read your emails in Canvas this week.

Final exam is in the near future.

Nov 15-8:57 PM

Class QZ 13

Given: $n = 185$, $\hat{p} = .4$

$x = n\hat{p}$
$= 185(.4) = \boxed{74}$

Find Conf. interval for the pop. proportion.

Give the margin of error.

→ NO C-level: Use .95

1-PropZInt

$\boxed{.329 < p < .471}$

$E = \frac{.471 - .329}{2} = \boxed{.071}$

Nov 15-9:06 PM