Statistics
Spring 2023
Lecture 14

Feb 19-8:47 AM

Class QZ 6

Drawing, labeling, shading, TI command required.

1) Find $z_{\alpha/2}$ for 94% C-level.

1 − .94 = .06

.06 ÷ 2 = .03

$z_{\alpha/2}$ = invNorm(.97, 0, 1) = 1.881 ✓

2) Find $t_{\alpha/2}$ for $\alpha = .06$ with df = 19

.06 ÷ 2 = .03 , 1 − .06 = .94

$t_{\alpha/2}$ = invT(.97, 19) = 2.000 ✓

May 9-9:09 PM

Testing One population Proportion:

SG 25

$H_0: p = p_0$ | $H_0: p \le p_0$ | $H_0: p \ge p_0$

$H_1: p \ne p_0$ | $H_1: p > p_0$ | $H_1: p < p_0$

TTT | RTT | LTT

Always identify the claim

Find all Critical values z

Draw, label, shade, TI command invNorm

Find CTS z
P-Value P $\Rightarrow$ 1-PropZTest, $z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$

use normalcdf

Use Testing chart to learn about H_0 & H_1.

Final conclusion about the claim

Reject the claim OR **Fail-To-Reject the claim**

Claim is invalid

claim is valid

May 16-6:53 PM

Given: $n = 150$, $\hat{p} = .12$, $\alpha = .02$, $H_0: p = .1$

claim is H_0.

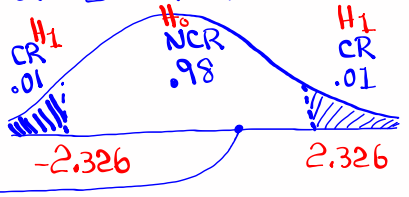
$\chi = n\hat{p} = 150(.12) = 18$

Test the claim.

$H_0: p = .1$ claim

$H_1: p \ne .1$ TTT

CV z TTT $\alpha = .02$



CTS $z = .816$

P-value $P = .414$

1-Prop Z Test

$P_0: .1$ H_0

$\chi = 18$

$n = 150$

Prop $\ne P_0$ H_1

Calculate

$z = \text{invNorm}(.99, 0, 1)$

CTS is in NCR

H_0 valid & H_1 invalid

P-value > α

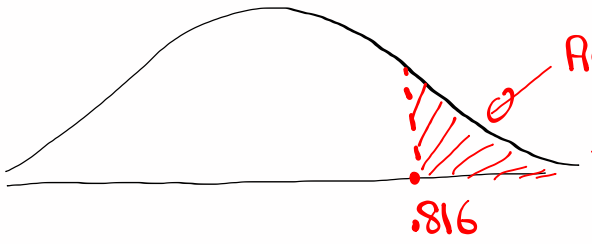
.414 .02

Valid claim

FTR the claim

May 16-7:01 PM

CTS $Z = .816$, TTT, find the P-value.



$= 2 * \text{normalcdf}(.816, E99, 0, 1)$

$= \boxed{.415}$

May 16-7:13 PM

The college claims that at most 42% of all students have part-time job. $P \leq .42$ ← H_0

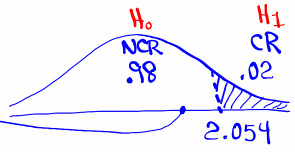
In a survey of 180 students, 45% of them had part-time job. $n = 180$, $\hat{p} = .45 \Rightarrow x = n\hat{p} = 180(.45) = \boxed{81}$

use $\boxed{\alpha = .02}$ to test the claim

$H_0: P \leq .42$ claim

$H_1: P > .42$ RTT

CV Z RTT $\alpha = .02$



CTS $Z = .815$

P-value $P = .207$

1-PropZTest

$P_0: .42$ H_0

$x = 81$

$n = 180$

Prop > P_0 H_1

Calculate

$Z = \text{invNorm}(.98, 0, 1)$

CTS is in NCR

H_0 Valid H_1 invalid

P-value > α

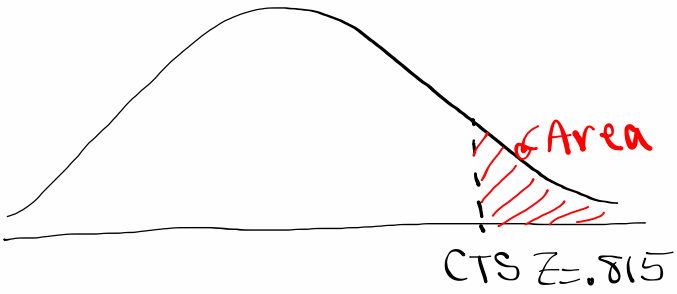
.207 > .02

Valid claim

FTR the claim

May 16-7:15 PM

CTS $Z = .815$, RTT, find p-value.



P-value = normalcdf(.815, E99, 0, 1)

= .208

May 16-7:29 PM

The college claims that less than 20% of all students use the tutoring services at college.

$p < .2$ claim

No = sign → H_1

I surveyed 325 students, 59 of them had used the tutoring services at college.

$n = 325$, $x = 59$

Test the claim.

$H_0: p \geq .2$

$H_1: p < .2$ claim, LTT

CTS $Z = -.832$

P-value $P = .203$

1-PropZTest

$P_0 = .2$

$x = 59$

$n = 325$

Prop $< P_0$

Calculate

CV Z LTT

No α ⇒ use .05

H_1 CR .05 | H_0 NCR .95

−1.645

$Z = \text{invNorm}(.05, 0, 1)$

CTS is in NCR.

P-value $> \alpha$

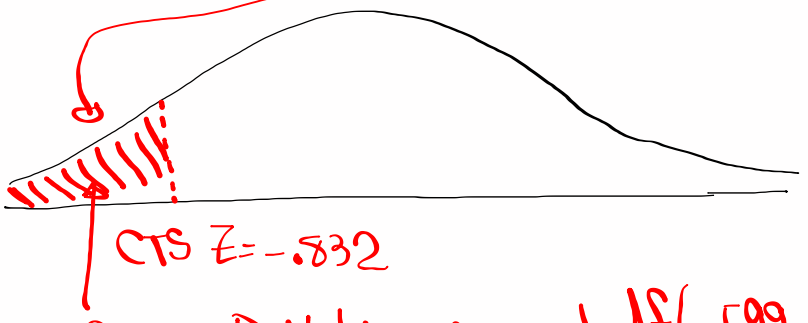
H_1 H_0 valid, H_1 invalid

Invalid claim

Reject the claim

May 16-7:31 PM

CTS $Z = -.832$, LTT, find P-value



Area = P-Value = normalcdf(-E99, -.832, 0, 1)

= .203

SG 25 ✓

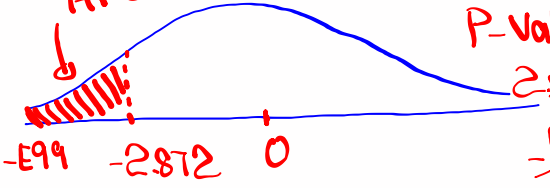
May 16-7:43 PM

Class QZ 7

CTS $Z = -2.872$, TTT, find P-value.

Drawing, labeling, Shading, TI Command.

Area * 2 = P-Value



P-value = 2 * normalcdf(-E99, -2.872, 0, 1)

= .004

May 16-7:45 PM

Testing one Population Mean:

$H_0: \mu = \mu_0$ | $H_0: \mu \geq \mu_0$ | $H_0: \mu \leq \mu_0$

$H_1: \mu \neq \mu_0$ | $H_1: \mu < \mu_0$ | $H_1: \mu > \mu_0$

TTT | LTT | RTT

Always identify the claim

Case I: σ Known	Case II: σ Unknown
CV z invNorm Drawing, labeling, shading TI command	CV t invT $df = n-1$ Drawing, labeling, shading, TI Command
CTS z P-value P $\Rightarrow$ Z-Test inpt: Stats	CTS t P-value P $\Rightarrow$ T-Test inpt: Stats

Use Testing chart to learn about H_0 & H_1.

Final Conclusion must be about the claim

Reject the claim OR FTR the claim

May 16-8:06 PM

Given: $n=35$, $\bar{x}=84$, $\sigma=12$, $H_0: \mu = 80$

claim is H_0, $\alpha = .02$.

Test the claim.

$H_0: \mu = 80$ claim

$H_1: \mu \neq 80$ TTT

CTS $z = 1.972$

P-value P = .049

Z-Test

inpt: Stats

μ_0: 80 H_0

σ: 12

$\bar{x}$: 84

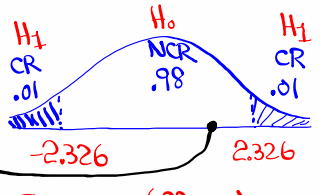
n: 35

$\mu \neq \mu_0$ H_1

Calculate

σ is Known

CV z TTT $\alpha = .02$



$z = \text{invNorm}(.99, 0, 1)$

CTS is in NCR.

P-value > α

.049 .02

H_0 Valid, H_1 invalid

Valid claim

Fail-To-Reject the claim.

May 16-8:13 PM

Given $H_0: \mu \leq 128$ claim is H_1

$n = 15$, $\bar{x} = 130$, $S = 20$

Test the claim. No α → use .05

σ is unknown

$H_0: \mu \leq 128$

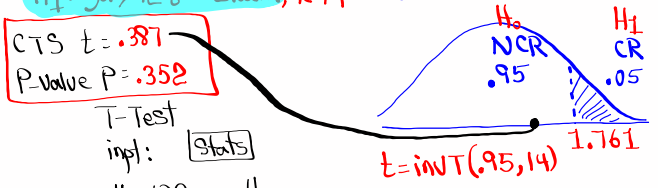
$H_1: \mu > 128$ claim, RTT

CV t RTT $\alpha = .05$

$df = n - 1 = 14$

CTS $t = .387$

P-value $P = .352$



T-Test

inpt: Stats

$\mu_0 = 128$ H_0

$\bar{x} = 130$

$S = 20$

$n = 15$

$\mu > \mu_0$ H_1

Calculate

$t = invT(.95, 14)$

CTS is in NCR

P-value > α

.352 .05

H_0 valid, H_1 invalid

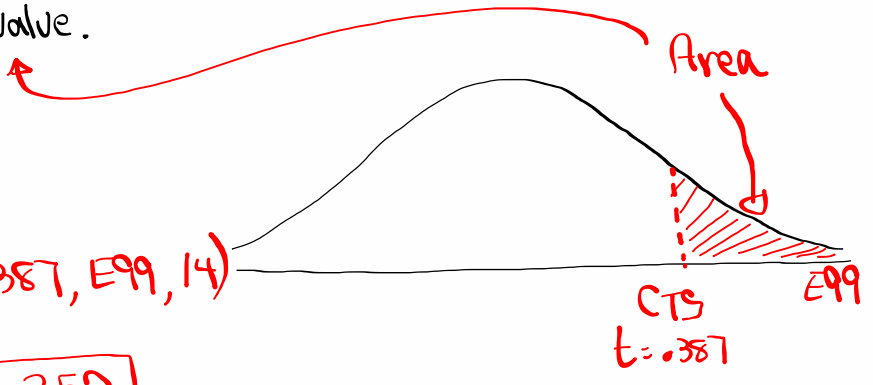
Invalid claim

Reject the claim

May 16-8:24 PM

CTS $t = .387$ RTT $df = 14$

Find P-value.

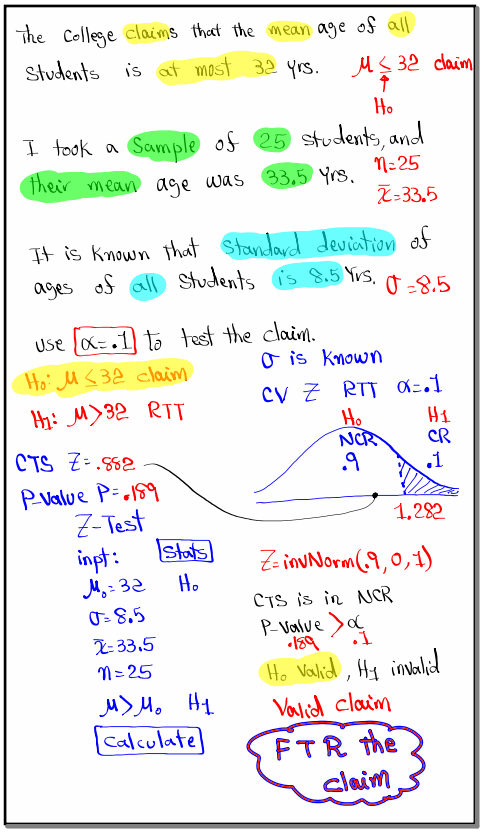


P-value =

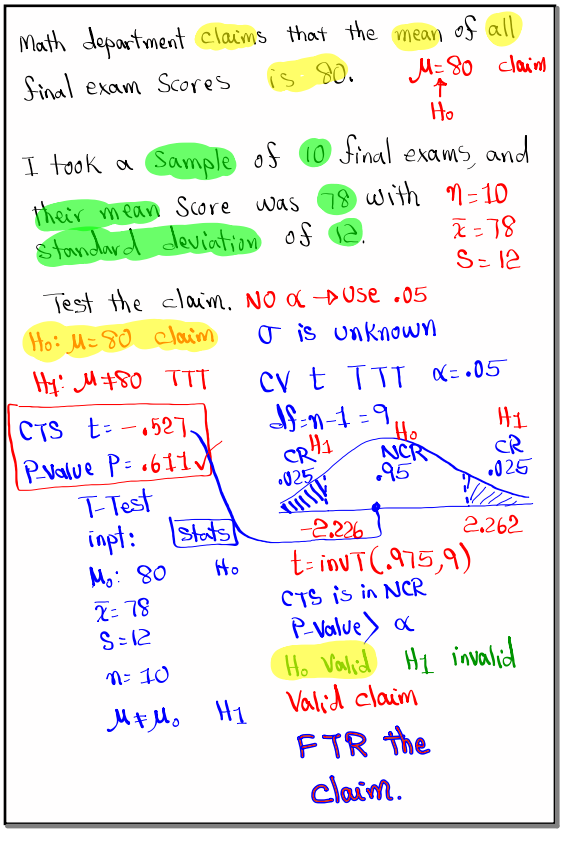
tcdf(.387, E99, 14)

= .352

May 16-8:35 PM



May 16-8:37 PM



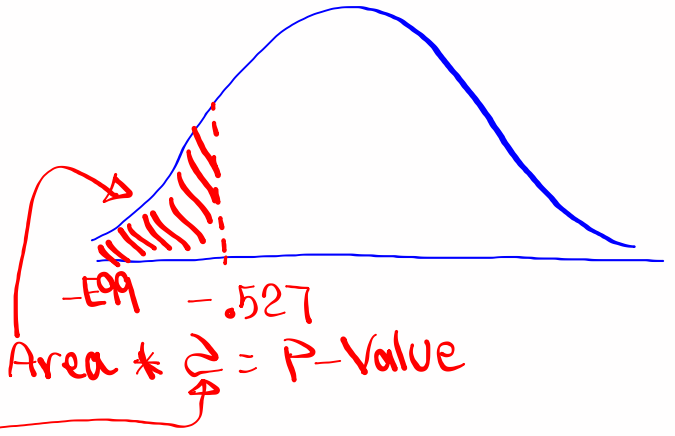
May 16-8:52 PM

CTS $t = -.527$

TTT

$df = 9$

Find P-Value.



P-Value $= 2 * tcdf(-E99, -.527, 9) =$ **.611**

May 16-9:10 PM

χ^2 - Dist.

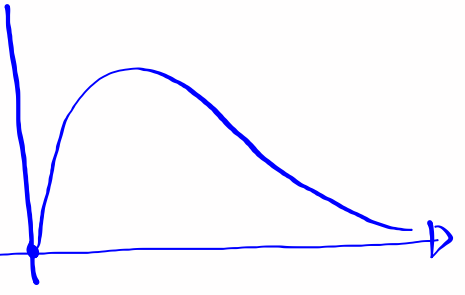
↑

chi - Square

1) Graph starts at 0, and skewed to the right, **Total Area = 1**

2) Not Symmetric

3) It comes with df.



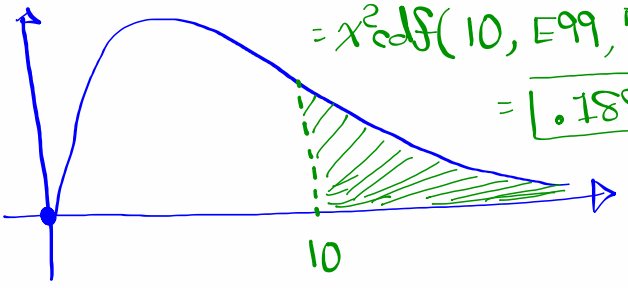
We use $\chi^2 cdf(L, U, df)$

May 16-9:13 PM

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

$= \chi^2cdf(10, E99, 7)$

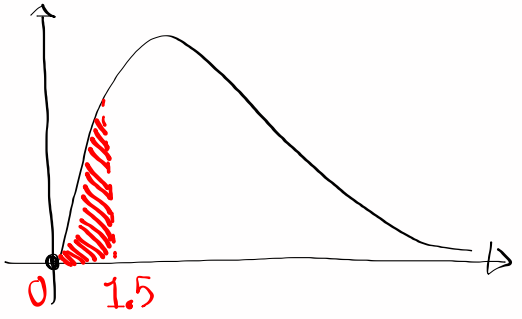
$= .189$



Find $P(\chi^2 < 1.5)$ with $df = 5$.

$= \chi^2cdf(0, 1.5, 5)$

$= .087$



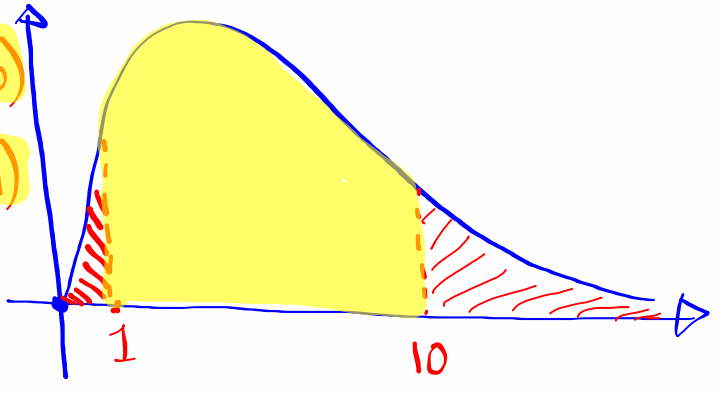
May 16-9:16 PM

Find $P(\chi^2 < 1 \text{ OR } \chi^2 > 10)$ with $df = 9$.

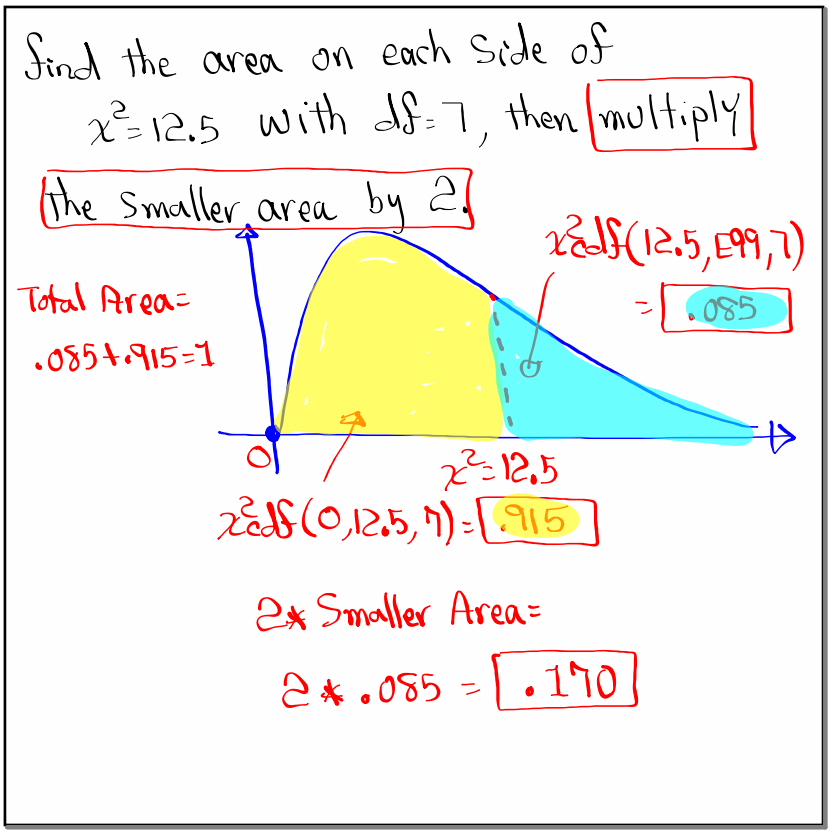
$= 1 - P(1 < \chi^2 < 10)$

$= 1 - \chi^2cdf(1, 10, 9)$

$= .351$



May 16-9:20 PM


Find the area on each side of
$\chi^2 = 12.5$ with df = 7, then multiply
the smaller area by 2.
Total Area=
.085+.915=1
χ^2cdf(12.5,E99,7)
= .085
0
$\chi^2 = 12.5$
χ^2cdf(0,12.5,7) = .915
2* Smaller Area=
2 * .085 = .170

May 16-9:23 PM