Statistics

Lecture 24

Feb 19-8:47 AM

The College claims that 20% of all female students are majoring in nursing.

$H_0: P = .2$ claim

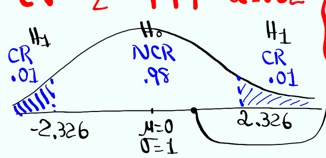
$H_1: p \neq .2$ TTT

In a survey of 180 female students, 22% of them were majoring in nursing.

$n = 180$
$\hat{p} = .22$ ⇒ $x = n\hat{p} = 180(.22) = 39.6$ [$x = 40$]
if decimal ⇒ Round-up

Use this survey to test the claim at $\alpha = .02$.

CV Z TTT $\alpha = .02$



$Z = \text{invNorm}(.99, 0, 1) = $ [2.326]

CTS $Z = .745$

P-value $P = .456$

1 − Prop Z Test
P_0: .2 H_0
$x = 40$
$n = 180$
Prop $\neq P_0$ H_1
[Calculate]

CTS is in NCR. H_0 valid ⇒ H_1 invalid
P-value $> \alpha$
↳ Valid claim → FTR the claim

Nov 25-12:35 PM

LA Times claims that at most 40% of all female voters are in favor of certain Proposition.

$H_0: p \le .4$ claim

$H_1: p > .4$ RTT

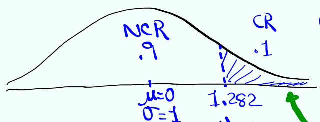
In a survey of 200 female voters, 45% of them had same views.

$n = 200$ $\quad x = n\hat{p} = 200(.45) = 90$

$\hat{p} = .45$ ⇒ If decimal → Round-up

Use $\alpha = .1$ to test the claim.

CV Z $\alpha = .1$ RTT



$Z = \text{invNorm}(.9, 0, 1) = 1.282$

CTS $Z = 1.443$

P-value $P = .074$

1 - Prop Z Test

$P_0 = .4$ H_0

$x = 90$

$n = 200$

Prop > P_0 H_1

Calculate

CTS is in CR. H_0 invalid

P-value $\le \alpha$ H_1 valid

→ Invalid claim → Reject the claim

Nov 25-12:48 PM

Testing Population Mean:

$H_0: \mu = \mu_0$	$H_0: \mu \le \mu_0$	$H_0: \mu \ge \mu_0$
$H_1: \mu \ne \mu_0$	$H_1: \mu > \mu_0$	$H_1: \mu < \mu_0$
TTT	RTT	LTT

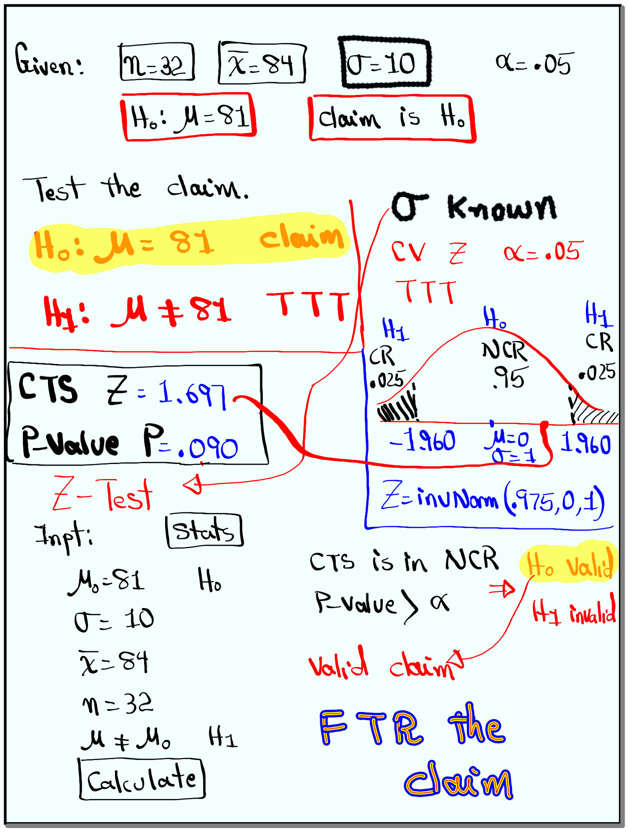
Case I: σ Known

CV Z invNorm	
CTS Z Z-Test P-value P inpt: Stats	
CTS $Z = \dfrac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$	

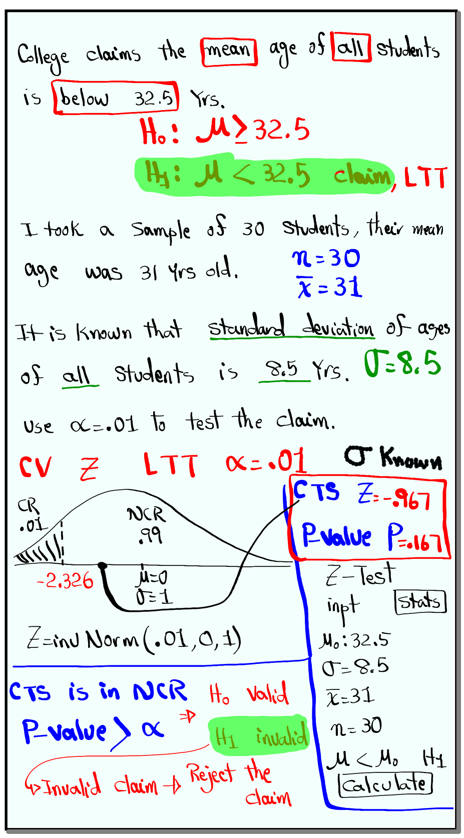
Proceed with testing chart

Draw final conclusion about the claim.

Nov 25-1:00 PM



Nov 25-1:06 PM



Nov 25-1:17 PM

Testing Population Mean:

$H_0: \mu = \mu_0$	$H_0: \mu \leq \mu_0$	$H_0: \mu \geq \mu_0$
$H_1: \mu \neq \mu_0$	$H_1: \mu > \mu_0$	$H_1: \mu < \mu_0$
TTT	RTT	LTT

Case I: σ Known	Case II: σ unknown
CV z invNorm	CV t invT df $= n-1$
CTS z, P-Value P — Z-Test, inpt: Stats	CTS t, P-Value P — T-Test, inpt: Stats
CTS $z = \dfrac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$	CTS $t = \dfrac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

Proceed with testing chart

Draw final conclusion about the claim.

Nov 25-1:00 PM

Given: $n = 15$ $\bar{x} = 85$ $s = 9$ $\alpha = .02$

$H_0: \mu \leq 82$ Claim is H_1

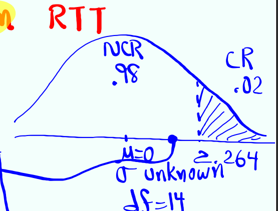
Test the claim. σ unknown

$H_0: \mu \leq 82$

$H_1: \mu > 82$ claim RTT

CV t RTT $\alpha = .02$

$df = n - 1 = 14$



$t = \text{invT}(.98, 14)$

CTS $t = 1.291$

P-Value $P = .109$

T-Test (σ unknown)

inpt: Stats

μ_0: 82 H_0

$\bar{x}$: 85

s: 9

n: 15

$\mu > \mu_0$ H_1

Calculate

CTS is in NCR

P-Value $> \alpha$

H_0 Valid

H_1 Invalid

→ Invalid claim

Reject the claim

Nov 25-1:45 PM

LA Times reported that the mean Salary for all nurses in LA is at least $7500/mo

$n=12$
$\bar{x}=7250$
$S=400$

$H_0: \mu \geq 7500$ claim

$H_1: \mu < 7500$ LTT

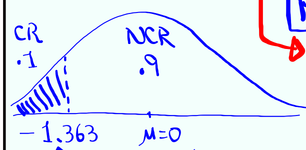
I took 12 nurses, their mean Salary was $7250/mo. with Standard deviation of $400.

σ unknown

Use $\alpha=.1$ to test the claim.

CV t invT LTT
$\alpha=.1$ $df=n-1=11$

CTS $t=-2.165$
P-Value $P=.027$



T-Test
inpt: Stats
$\mu_0: 7500$ H_0
$\bar{x}=7250$
$S=400$
$n=12$
$\mu < \mu_0$ H_1
Calculate

$CV = invT(.1, 11) =$

CTS is in CR
P-Value $\leq \alpha$ ⇒ H_0 invalid, H_1 valid → Invalid claim → Reject the claim

Nov 25-1:55 PM

I randomly selected 8 exams. Here are the Scores (Sample)

85	76	95	100
65	84	75	80

Store in L1
Use 1-Var Stats
$\bar{x} \approx 83$
$s \approx 11$ } whole #

No α → .05

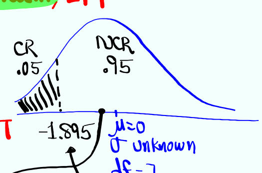
Test the claim that the mean of all exams is below 85. $\mu < 85$

$H_0: \mu \geq 85$

$H_1: \mu < 85$ claim, LTT

σ unknown

CV t $\alpha=.05$
$df=n-1=7$ LTT



$t=invT(.05, 7)=$

CTS $t=-.514$
P-Value $P=.311$

T-Test
$\mu_0=85$ H_0
$\bar{x}=83$
$s=11$
$n=8$
$\mu < \mu_0$ H_1
Calculate

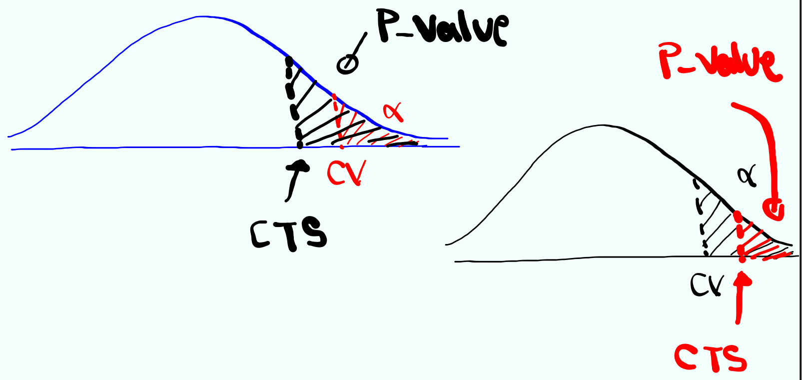
CTS is in NCR
P-Value $> \alpha$
H_0 valid, H_1 invalid
invalid claim
Reject the claim

Nov 25-2:08 PM

What is P-Value?

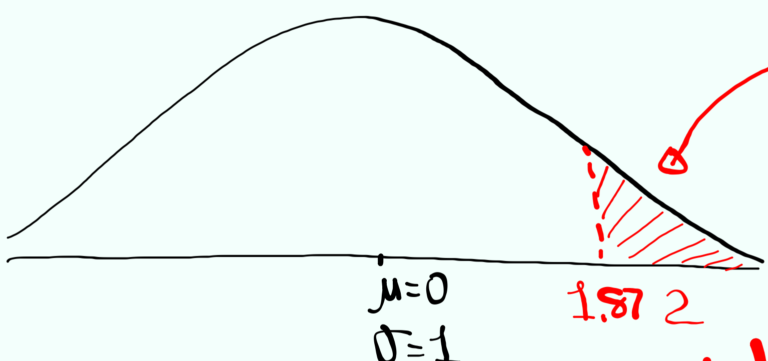
It is the area of the tail in the graph of dist. marked by CTS.

Multiply by 2 if doing TTT.



Nov 25-2:21 PM

CTS $Z = 1.872$ RTT Find P-Value



normalcdf(1.872, E99, 0, 1)

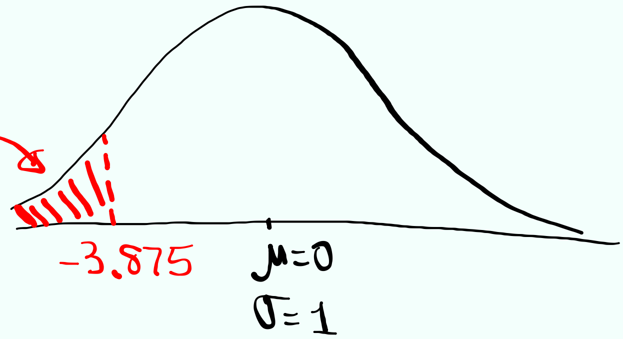
= .031

If TTT → P-Value = 2(.031) = .062

Nov 25-2:24 PM

CTS $z = -3.875$ LTT

find p-value.



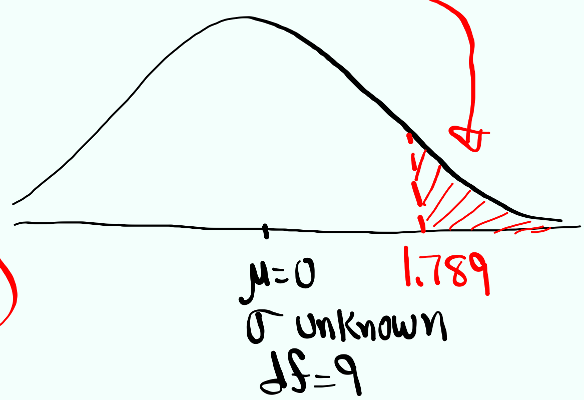
normalcdf(−E99, −3.875, 0, 1) = 5.3×10^{-5}

If TTT → P-value $= 2(5.3 \times 10^{-5}) = 1.1 \times 10^{-4}$

Nov 25-2:28 PM

CTS $t = 1.789$ $df = 9$ RTT

find p-value.



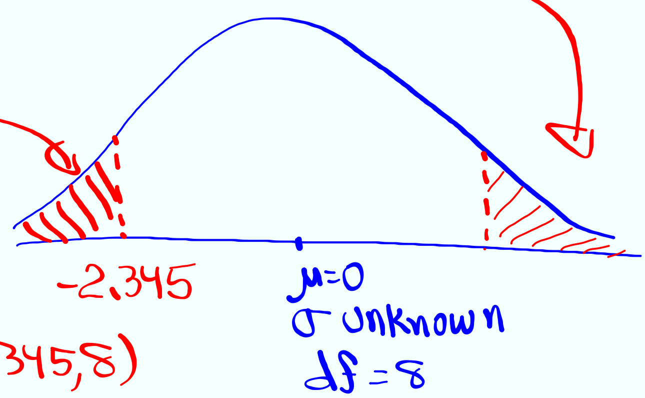
L U df
tcdf(1.789, E99, 9)
= .054

If TTT ⇒ P-value $= 2(.054) = .108$

Nov 25-2:33 PM

CTS $t = -2.345$ $df = 8$ TTT

find p-value.



$2 \cdot tcdf(-E99, -2.345, 8)$

$= .047$

Nov 25-2:36 PM