Statistics

Lecture 14

Feb 19-8:47 AM

The College claims that about 35% of all students use the tutoring services. $P = .35$ (H_0)

$n = 425$

I took a sample of 425 students and 32% of them had used tutoring services. $\hat{P} = .32$

Use this sample to test the claim. No $\alpha \rightarrow .05$

H_0: $P = .35$ claim

H_1: $P \neq .35$ TTT

$x = n\hat{P} = 425(.32) = 136$

if decimal → Round-Up

CTS $Z = -1.297$

P-value $P = .195$

1-Prop Z Test

$P_0 : .35$ H_0

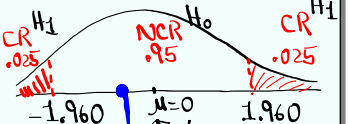
$x = 136$

$n = 425$

Prop $\neq P_0$ H_1

Calculate

CV Z TTT $\alpha = .05$



$Z = \text{invNorm}(.975, 0, 1)$

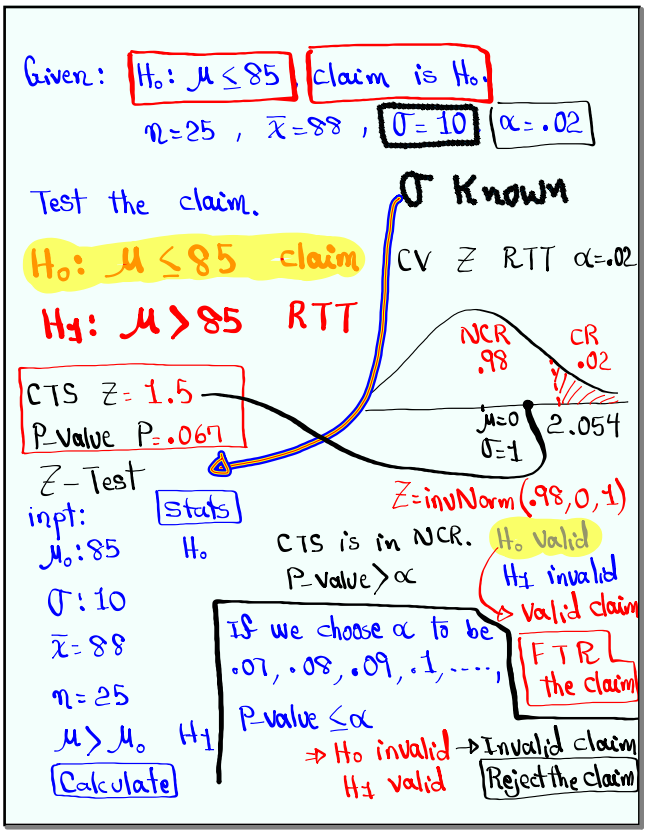
CTS is in NCR. ⇒ H_0 valid

P-value $> \alpha$ H_1 invalid

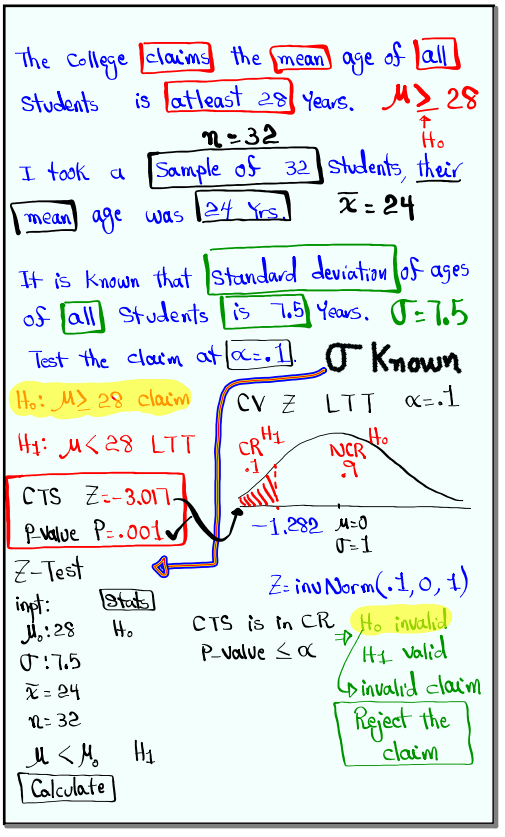
valid claim

FTR the claim

Dec 6-11:38 AM



Dec 6-11:53 AM

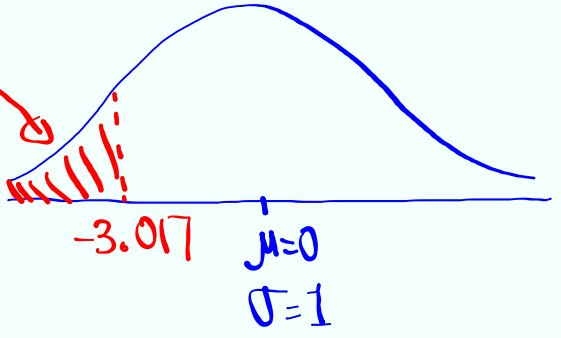


Dec 6-12:07 PM

CTS $Z = -3.017$

LTT

Find P-Value.



normalcdf(-E99, -3.017, 0, 1)

$= .001$

If it was TTT ⇒ P-value $= 2(.001)$

$= .002$

Dec 6-12:22 PM

Given: $H_0: \mu \leq 125$, claim is H_1.

$n = 20$, $\bar{x} = 135$, $S = 15$

Test the claim.

$H_0: \mu \leq 125$

$H_1: \mu > 125$ claim, RTT

σ Unknown

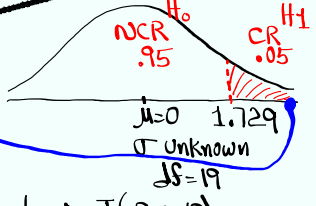
CV t RTT

No α → .05

df = n-1 = 19

CTS $t = 2.981$

P-value $P = .004$



T-Test

inpt: Stats

$\mu_0: 125$ H_0

$\bar{x} = 135$

$S = 15$

$n = 20$

$\mu > \mu_0$ H_1

$t = invT(.95, 19)$

CTS is in CR. H_0 invalid

P-value < α ⇒ H_1 valid

⇒ valid claim

FTR the claim

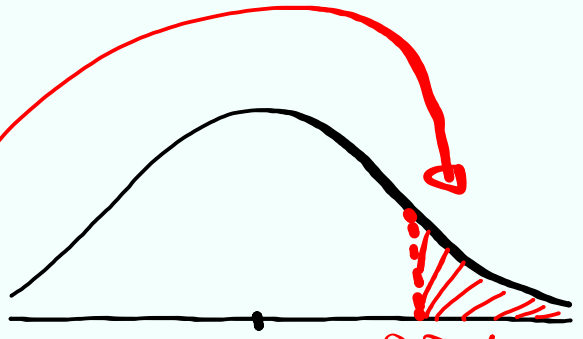
Dec 6-12:25 PM

CTS $t = 2.981$

$df = 19$

RTT

find **p-value.**



σ unknown

$df = 19$

$\rightarrow$ tcdf(2.981, E99, 19)

$= .004$

If it was TTT $\Rightarrow$ P-value $= 2(.004) = .008$

Dec 6-12:36 PM

LA Times claims that the mean salary of all nurses in LA County is $7200/month.

$\mu = 7200$

$n = 10$

I took a sample of 10 nurses from LA county, their mean monthly salary was $7500 with standard deviation of $400.

$\bar{x} = 7500$

$s = 400$

Use $\alpha = .02$ to test the claim.

H_0: $\mu = 7200$ claim

H_1: $\mu \neq 7200$ TTT

σ unknown

CV t TTT $\alpha = .02$

$df = n-1 = 9$

CTS $t = 2.372$

P-Value P=.042 ✓

T-Test

inpt: Stats

μ_0: 7200 H_0

$\bar{x}$: 7500

s: 400

n: 10

$\mu \neq \mu_0$ H_1

$df = 9$

t=invT(.99, 9)=

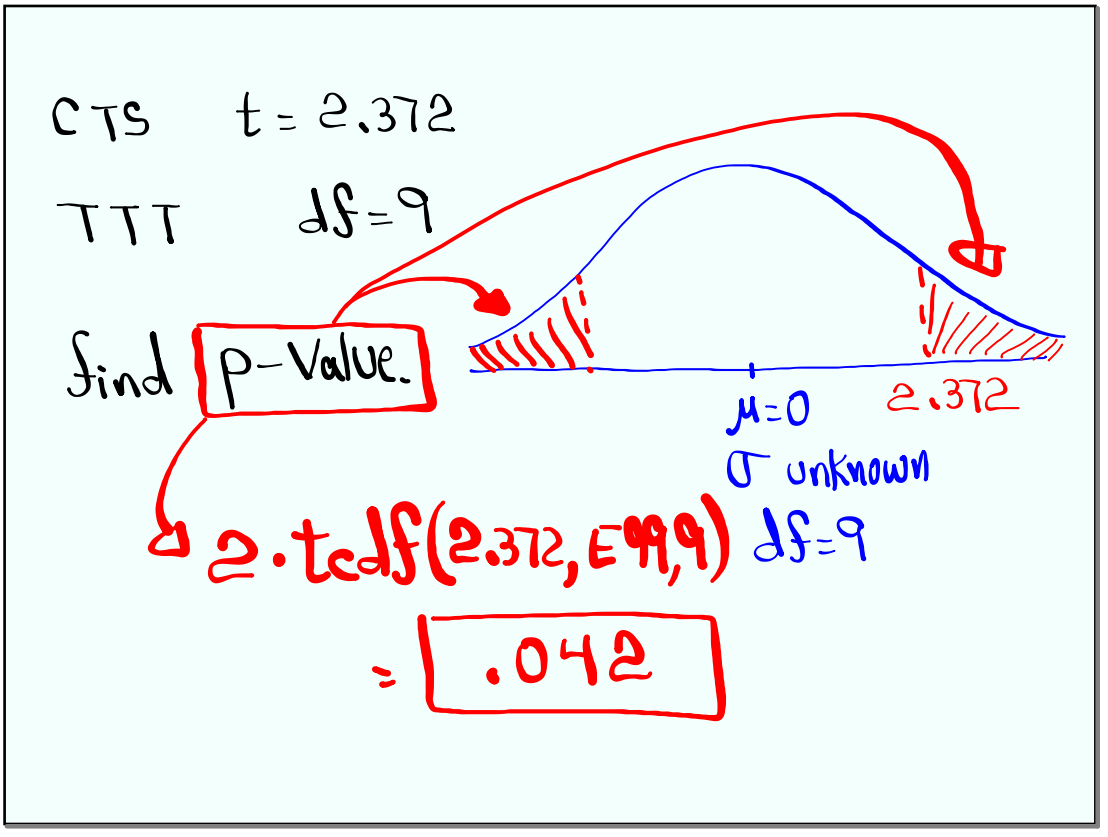
CTS is in NCR

P-value $> \alpha$ $\Rightarrow$ H_0 valid, H_1 invalid $\rightarrow$ valid claim

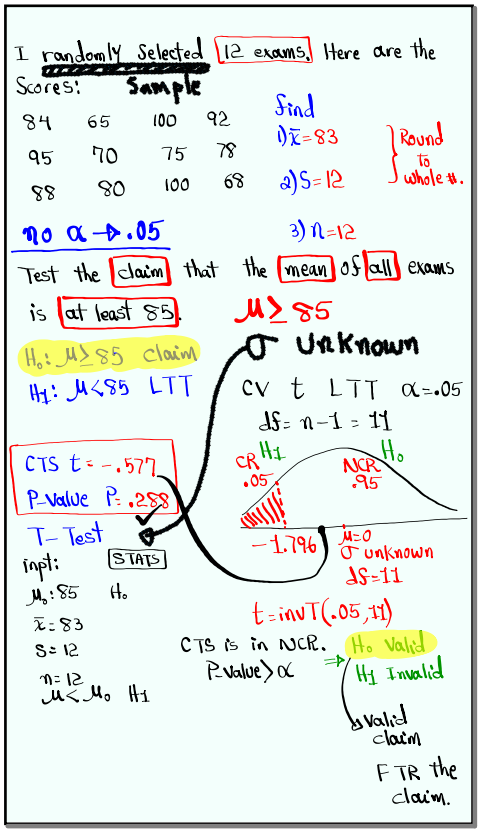
FTR the claim

If we choose α to be .05, .06, .07, .08, .09, .1 then P-value $\leq \alpha$ $\rightarrow$ H_0 invalid $\rightarrow$ invalid claim $\rightarrow$ Reject the claim

Dec 6-12:54 PM



Dec 6-1:09 PM

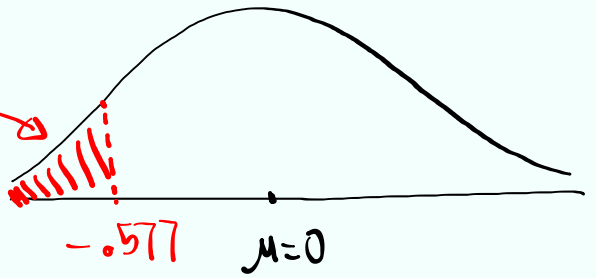


Dec 6-1:13 PM

CTS $t = -.577$

LTT $df = 11$

find P-Value



σ unknown

$df = 11$

$tcdf(-E99, -.577, 11)$

$= .288$

Dec 6-1:28 PM

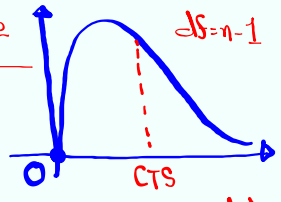
SG 27

Testing one population standard deviation:

$H_0: \sigma = \sigma_0$	$H_0: \sigma \geq \sigma_0$	$H_0: \sigma \leq \sigma_0$
$H_1: \sigma \neq \sigma_0$	$H_1: \sigma < \sigma_0$	$H_1: \sigma > \sigma_0$
TTT	LTT	RTT

P-Value Method

CTS $\chi^2 = \frac{(n-1)\cdot s^2}{\sigma^2}$ chi-Square



P-value $> \alpha$ H_0 valid RTT $\chi^2cdf(CTS, E99, df)$

H_1 invalid LTT $\chi^2cdf(0, CTS, df)$

P-value $\leq \alpha$ H_0 invalid TTT Find both areas, multiply the smaller area by 2.

H_1 valid

Final Conclusion must be about claim

Dec 6-1:31 PM

Given: $H_0: \sigma \leq 10$, claim is H_0, $\alpha = .02$

$n = 8$, $S = 12$

Test the claim.

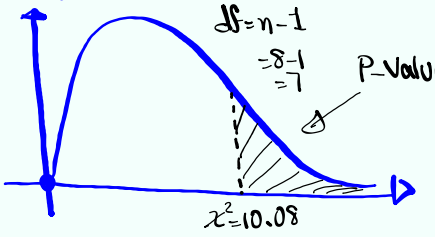
$H_0: \sigma \leq 10$ claim

$H_1: \sigma > 10$ RTT

CTS $\chi^2 = \frac{(n-1)\cdot s^2}{\sigma^2} = \frac{(8-1)\cdot 12^2}{10^2}$

$= 10.08$

P-Value



P-Value $= \chi^2 cdf(10.08, E99, 7)$

$= .184$

P-Value $> \alpha$

.184 .02

H_0 valid

H_1 invalid

FTR the claim ← valid claim

Dec 6-1:53 PM

The math department claims standard dev. of all math exams is below 8. $\sigma < 8$ (H_1)

$n = 10$

I took a sample of 10 exams, standard deviation of their scores was 5.

$S = 5$

Test the claim at $\alpha = .1$

$H_0: \sigma \geq 8$

$H_1: \sigma < 8$ claim, LTT

CTS $\chi^2 = \frac{(n-1)S^2}{\sigma^2} = \frac{(10-1)\cdot 5^2}{8^2}$

$= 3.516$

P-Value χ^2 dist. $df = n - 1 = 9$

P-Value $= \chi^2 cdf(0, 3.516, 9)$

$= .060$

P-Value $< \alpha$

.060 .1

H_0 invalid

H_1 valid

valid claim

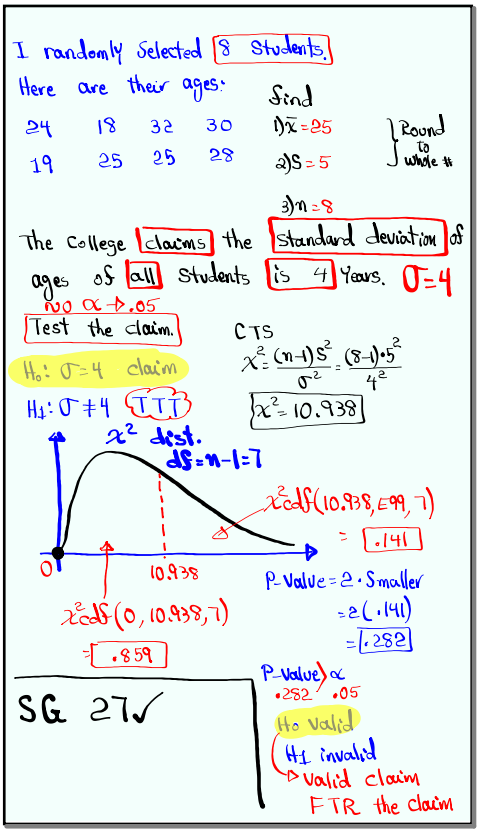
FTR the claim

If we choose $\alpha = .05, .04, .03, .02, .01$, then P-Value $> \alpha$

H_0 valid

H_1 invalid → Invalid claim → Reject it.

Dec 6-2:01 PM


I randomly selected 8 students.
Here are their ages:
24 18 32 30
19 25 25 28
Find
1) $\bar{x}=25$
2) $s=5$
Round to whole #
3) $n=8$
The College claims the standard deviation of ages of all students is 4 years. $\sigma=4$
no $\alpha \rightarrow .05$
Test the claim.
$H_0: \sigma=4$ claim
$H_1: \sigma \neq 4$ TTT
CTS
$\chi^2=\frac{(n-1)s^2}{\sigma^2}=\frac{(8-1)\cdot 5^2}{4^2}$
$\chi^2=10.938$
χ^2 dist.
df = n-1=7
χ^2cdf(10.938, E99, 7)
= .141
0
10.938
χ^2cdf(0, 10.938, 7)
= .859
P-Value = 2 · Smaller
= 2(.141)
= .282
SG 27✓
P-Value α
.282 .05
H_0 valid
H_1 invalid
valid claim
FTR the claim

Dec 6-2:12 PM