Statistics
Lecture 27

Feb 19-8:47 AM

In a Survey of 450 LA residents, 72% of them were fan of LA Dodgers. $n=450$, $\hat{p}=.72$ $\Rightarrow x=n\hat{p}=450(.72)=324$ (if decimal $\Rightarrow$ Round-up)

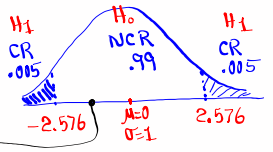
ESPN claims that 75% of all LA residents are fan of LA Dodgers. $p=.75$ claim (H_0)

Test this claim by using the Survey at $\alpha=.01$

$H_0: p=.75$ claim

$H_1: p\neq.75$ TTT

CV Z TTT $\alpha=.01$



CTS $Z=-1.470$

P-value $P=.142$

1-PropZTest

$Z=\text{invNorm}(.995,0,1)$

CTS is in NCR $\Rightarrow$ P-value $>\alpha$ $\Rightarrow$ H_0 valid, H_1 invalid $\Rightarrow$ Valid claim $\Rightarrow$ FTR the claim

If we choose $\alpha=.15, .16, .17, .18, \ldots$

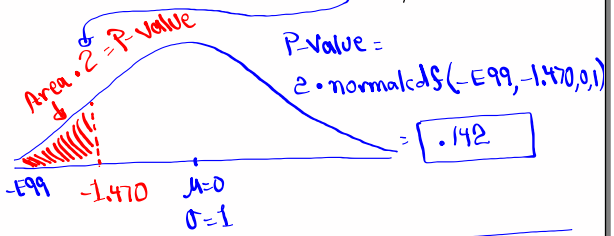
then P-value $\leq\alpha$, therefore H_0 invalid

Invalid claim

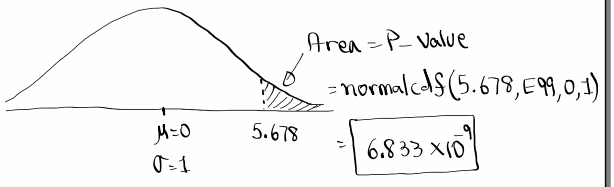
Reject the claim

Dec 7-7:21 AM

Given CTS $Z = -1.470$, TTT, find P-value.



CTS $Z = 5.678$, RTT, find P-value



Dec 7-7:36 AM

LAPD claims that the mean age of all police officers is more than 55 yrs. $\mu > 55$ claim, NO = Sign, H_1

In a Sample of 40 police officers, their mean age was 62 yrs. $n = 40$, $\bar{x} = 62$

It is known that standard deviation of ages of all police officers is 8.5 yrs. $\sigma = 8.5$

NO α

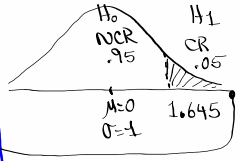
Test the claim.

$H_0: \mu \leq 55$

$H_1: \mu > 55$ claim, RTT

σ is known

CV Z RTT $\alpha = .05$



$Z = \text{invNorm}(.95, 0, 1)$

CTS $Z = 5.208$

P-value $P = 9.539 \times 10^{-8}$

Z-Test

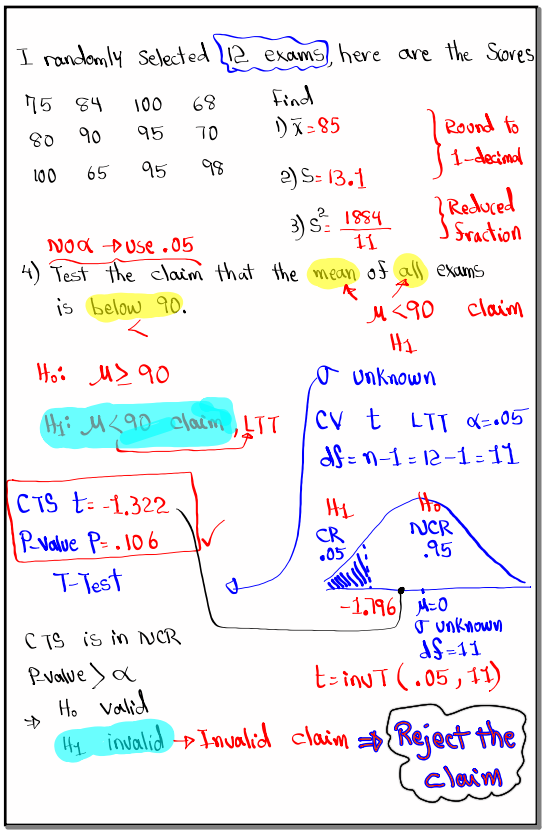
CTS is in CR H_0 invalid

P-value $\leq \alpha \Rightarrow$ H_1 valid

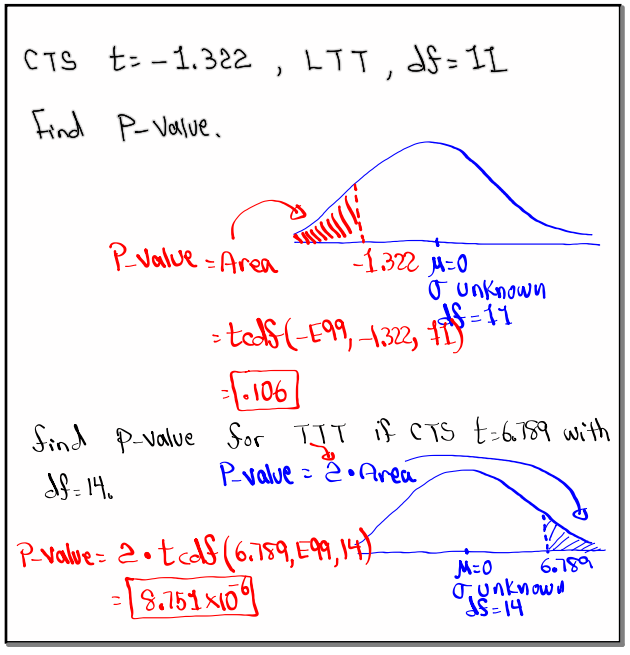
↳ valid claim

FTR the claim

Dec 7-7:43 AM



Dec 7-8:00 AM



Dec 7-8:19 AM

Testing One Population standard deviation: SG 27

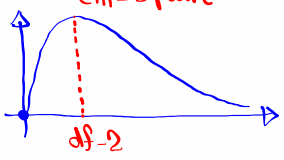
$H_0: \sigma = \sigma_0$ | $H_0: \sigma \le \sigma_0$ | $H_0: \sigma \ge \sigma_0$

$H_1: \sigma \ne \sigma_0$ | $H_1: \sigma > \sigma_0$ | $H_1: \sigma < \sigma_0$

TTT | RTT | LTT

P-Value Method:

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



To Find the P-Value (df = n-1)

use χ^2_{cdf}

RTT $\chi^2_{cdf}(CTS, E99, df)$

LTT $\chi^2_{cdf}(0, CTS, df)$

TTT Find area on both sides of CTS

P-Value = 2 * Smaller area

Proceed with Testing chart & P-value method to determine the validity of H_0 & H_1

Draw Final Conclusion about the claim.

Dec 7-8:45 AM

Given $n=10$, $S=12$, $\alpha = .1$

$H_0: \sigma \le 10$, claim is H_0.

Test the claim

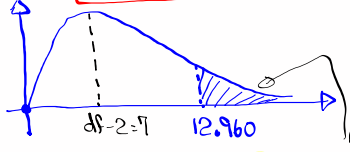
$H_0: \sigma \le 10$ claim

$H_1: \sigma > 10$ RTT

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

chi-Sqr $= \frac{(10-1)\cdot 12^2}{10^2}$

$= 12.960$



$df = n-1 = 9$

Area = P-Value

$= \chi^2_{cdf}(12.960, E99, 9)$

$= .164$

P-value > α

.164 > .1

H_0 valid

H_1 invalid

Valid claim

FTR the claim

Dec 7-8:53 AM

Math department claims that the standard deviation of all math exam scores is at least 8. $\sigma \geq 8$ (≥ 8)

I took a sample of 10 exams, and standard deviation of their scores was 6.5. $n=10$, $S=6.5$

No α → use .05

Test the claim.

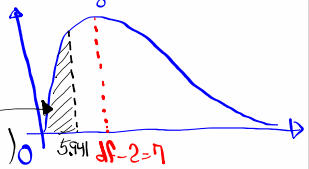
H_0: $\sigma \geq 8$ claim

H_1: $\sigma < 8$ LTT

P-Value Method

CTS $\chi^2 = \frac{(n-1)\cdot S^2}{\sigma^2}$ $df = n-1 = 9$

$\chi^2 = \frac{(10-1)\cdot 6.5^2}{8^2} = 5.941$



P-Value = Area

$= \chi^2cdf(0, 5.941, 9)$

$= .254$

P-value > α

.254 .05

$\Rightarrow$ H_0 valid → Valid claim

H_1 invalid

FTR the claim

Dec 7-9:01 AM

Standard deviation of monthly salaries of 12 randomly selected nurses was \$400. $n=12$, $S=400$, $df = 12-1 = 11$

LA Times claim that standard deviation of monthly salaries of all nurses is \$500. claim $\sigma = 500$

use $\alpha = .02$ to test the claim. H_0

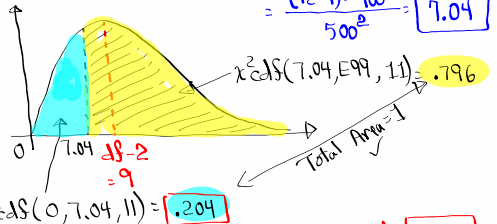
H_0: $\sigma = 500$ claim

H_1: $\sigma \neq 500$ TTT

P-Value Method

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

$= \frac{(12-1)\cdot 400^2}{500^2} = 7.04$



$\chi^2cdf(7.04, E99, 11) = .796$

$\chi^2cdf(0, 7.04, 11) = .204$

P-Value = 2 * Smaller area = 2(.204) = .408

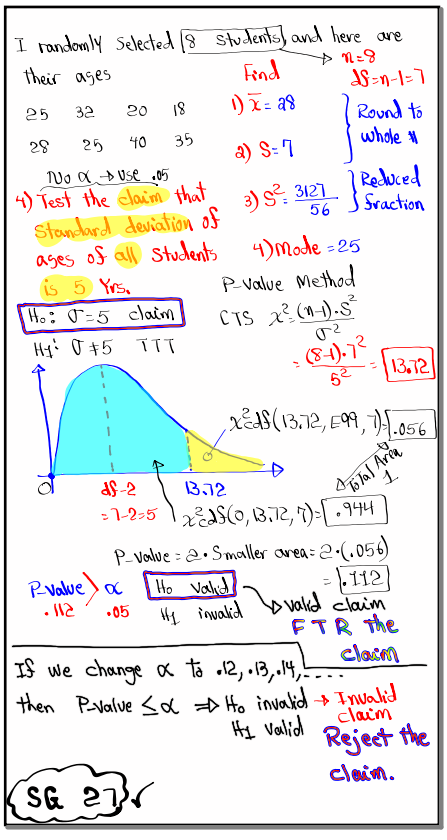
P-value > α

.408 .02

$\Rightarrow$ H_0 valid Valid claim

H_1 invalid FTR the claim

Dec 7-9:13 AM


I randomly selected 8 students and here are their ages
25 32 20 18
28 25 40 35
Find
1) $\bar{x}$ = 28
2) S = 7
3) $S^2 = \frac{3127}{56}$
4) Mode = 25
n = 8
df = n-1 = 7
Round to whole #
Reduced fraction
No α → Use .05
4) Test the claim that Standard deviation of ages of all students is 5 Yrs.
P-Value Method
H_0: σ = 5 claim
H_1: σ ≠ 5 TTT
CTS $\chi^2 = \frac{(n-1)\cdot S^2}{\sigma^2}$
$= \frac{(8-1)\cdot 7^2}{5^2} = 13.72$
$\chi^2_{cdf}(13.72, E99, 7) = .056$
Total Area 1
df = 7-2 = 5
13.72
$\chi^2_{cdf}(0, 13.72, 7) = .944$
P-value = 2 · Smaller area = 2·(.056)
= .112
P-value > α
.112 .05
H_0 valid
H_1 invalid
Valid claim
FTR the claim
If we change α to .12, .13, .14, ...
then P-value ≤ α ⇒ H_0 invalid → Invalid claim
H_1 valid
Reject the claim.
SG 27

Dec 7-9:26 AM