

Statistics
Lecture 26



Feb 19-8:47 AM

Testing One Population Proportion: SG-25

| | | |
|-------------------|-------------------|-------------------|
| $H_0: p = p_0$ | $H_0: p \leq p_0$ | $H_0: p \geq p_0$ |
| $H_1: p \neq p_0$ | $H_1: p > p_0$ | $H_1: p < p_0$ |
| TTT | RTT | LTT |

Always identify the claim

CV Z invNorm

Drawing, labeling, shading, Full TI command required.

CTS Z \Rightarrow 1-PropZTest

P-value P

use testing chart to determine the validity of H_0 & H_1 .

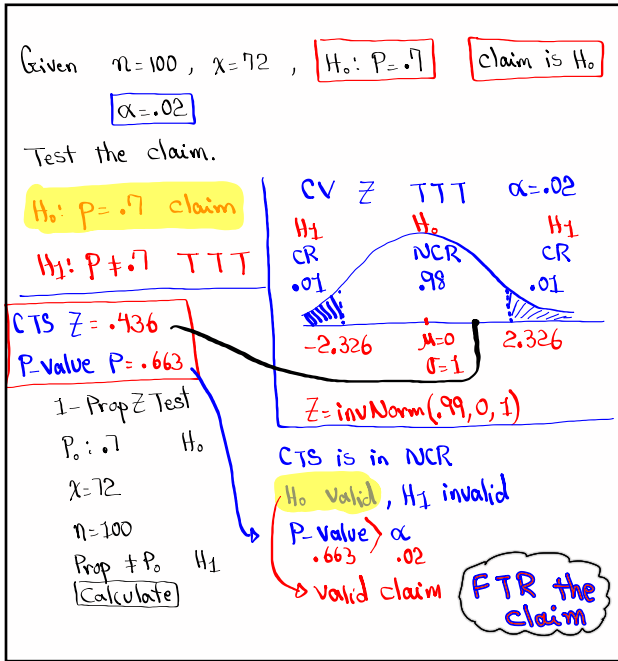
Draw final conclusion for the claim

Reject the claim OR **Fail-to-Reject the claim**

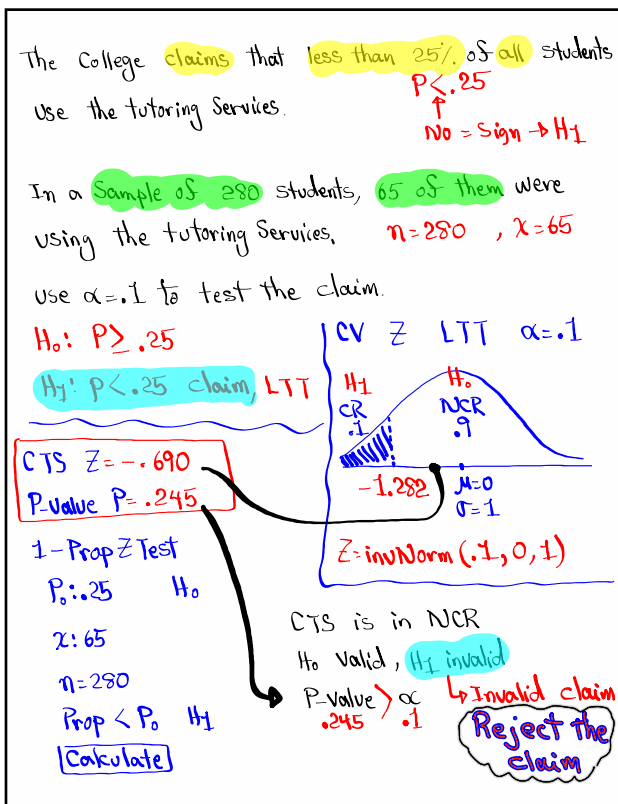
when claim is invalid

when claim is valid

Dec 6-7:21 AM



Dec 6-7:29 AM



Dec 6-7:41 AM

The College claims that at most 75% of all students have been vaccinated for covid-19.

$P \leq .75$
 H_0

In a sample of 400 students, 80% of them were vaccinated for covid-19.

$n = 400$
 $\hat{P} = .8 \rightarrow x = n\hat{p} = 400(.8) = 320$
 if decimal \rightarrow Round up

Test the claim \rightarrow NO α
 \Rightarrow use .05

$H_0: P \leq .75$ claim
 $H_1: P > .75$ RTT

CV Z RTT $\alpha = .05$

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

CTS $Z = 2.309$
 P-value $P = .010$

1-Prop Z Test
 $P_0 = .75$ H_0
 $x = 320$
 $n = 400$
 $\text{Prop} > P_0$ H_1
 Calculate

CTS is in CR
 H_0 invalid H_1 valid
 $P\text{-value} < \alpha$
 $.010 < .05 \rightarrow$ Invalid claim
 Reject the claim

Dec 6-7:55 AM

The College claims that 40% of all students are fan of online classes.

$P = .4$
 H_0

In a sample of 350 students, 43% of them were fan of online classes.

$n = 350$
 $\hat{P} = .43$
 $x = n\hat{p} = 350(.43) \approx 151$
 if decimal \rightarrow Round up

Use $\alpha = .01$ to test the claim.

$H_0: P = .4$ claim
 $H_1: P \neq .4$ TTT

CV Z TTT $\alpha = .01$

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

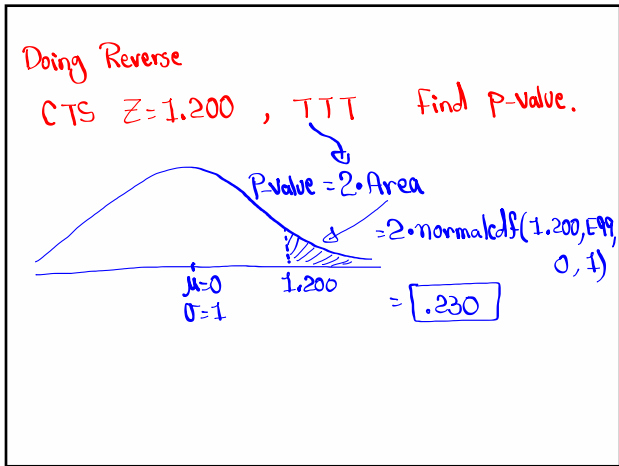
CTS $Z = 1.200$
 P-value $P = .230$

1-Prop Z Test
 $P_0 = .4$ H_0
 $x = 151$
 $n = 350$
 $\text{Prop} \neq P_0$ H_1
 Calculate

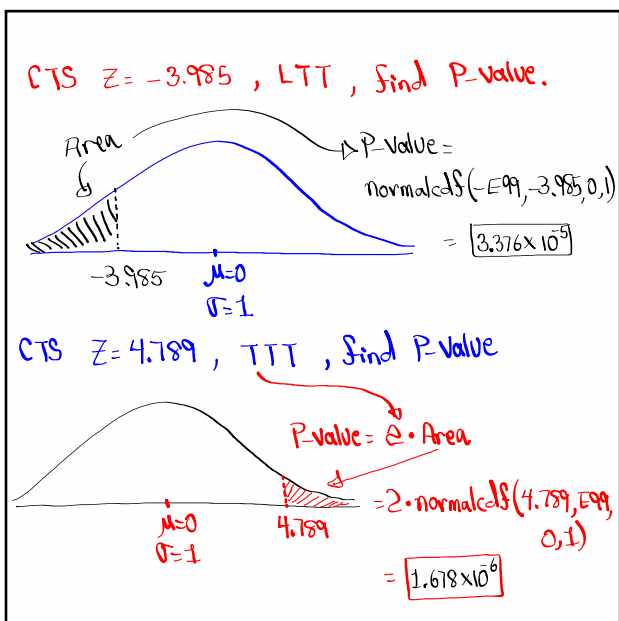
CTS is in NCR H_0 valid
 $P\text{-value} > \alpha$
 $.230 > .01 \rightarrow$ Valid claim
 FTR the claim

If we choose $\alpha = .24, .25, .26, \dots$
 $P\text{-value} \leq \alpha \Rightarrow H_0$ invalid \rightarrow Invalid claim
 Reject the claim

Dec 6-8:08 AM



Dec 6-8:21 AM



Dec 6-8:24 AM

Testing One 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

CV Z invNorm

CTS $Z \Rightarrow Z$ -Test

P-value P inpt: **STATS**

use **Testing Chart** to determine the validity of H_0 & H_1 .

Draw final conclusion about the claim

Reject the claim OR FTR the claim

"claim is invalid" "claim is valid"

Dec 6-8:45 AM

Given: $n=36$, $\bar{x}=85$, $\sigma=10$, $\alpha=.1$

$H_0: \mu=80$ claim is H_1

Test the claim.

$H_0: \mu=80$

$H_1: \mu \neq 80$ TTT, claim

Since σ is known
CV Z TTT $\alpha=.1$

CTS $Z=3$

P-value $P=.003$

Z -Test \swarrow

inpt: **STATS**

$\mu_0: 80$ H_0

$\sigma=10$

$\bar{x}=85$

$n=36$

$\mu \neq \mu_0$ H_1

Calculate

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

CTS is in CR $\Rightarrow H_0$ invalid

$P\text{-value} < \alpha$
 $.003 < .1$

H_1 Valid

valid claim

FTR the claim

Dec 6-8:51 AM

Math Department claims that the mean of all exams is at most 85. $\mu \leq 85$
 H_0

I took a sample of 40 exams, their mean score was 88. $n=40, \bar{x}=88$

It is known that standard deviation of scores of all exams is 12.5. $\sigma=12.5$

Test the claim.
 $H_0: \mu \leq 85$ claim
 $H_1: \mu > 85$ RTT

σ known
 CV Z RTT No $\alpha \Rightarrow 0.05$

CTS $Z = 1.518$
 P-value $P = .065$

Z-Test
 inpt: [STATS]
 $\mu_0: 85$ H_0
 $\sigma: 12.5$
 $\bar{x}: 88$
 $n: 40$
 $\mu > \mu_0$ H_1
 [Calculate]

$Z = \text{invNorm}(.95, 0, 1)$
 CTS is in NCR
 P-value $> \alpha$
 $.065 > .05$
 H_0 valid
 H_1 invalid
 Valid claim
 FTR the claim

If we change α to $.07, .08, .09, .10$
 P-value $\leq \alpha$
 H_0 invalid \rightarrow Invalid claim \rightarrow Reject the claim
 H_1 valid \rightarrow Valid claim \rightarrow FTR the claim

Dec 6-9:03 AM

Testing One 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 \Rightarrow Z-Test | CTS t \Rightarrow T-Test |
| P-value P inpt: [STATS] | P-value P inpt: [Stats] |

Use Testing Chart to determine the validity of H_0 & H_1 .

Draw final conclusion about the claim
Reject the claim OR FTR the claim
 "claim is invalid" "claim is valid"

Dec 6-8:45 AM

Given $n=12$, $\bar{x}=32$, $S=8.8$ $\alpha=.1$

$H_0: \mu=35$ Claim is H_0 .

Test the claim.

$H_0: \mu=35$ claim

$H_1: \mu \neq 35$ TTT

CTS $t = -1.181$
P-value $P = .263$

T-Test
inpt: **Stats**
 $\mu_0: 35$ H_0
 $\bar{x}: 32$
 $S: 8.8$
 $n: 12$
 $\mu \neq \mu_0$ H_1
Calculate

σ is unknown
CV t TTT $\alpha=.1$
 $df = n-1 = 11$

$t = \text{invT}(.95, 11)$

CTS is in NCR

P-value $> \alpha$
.263 $>$.1

H_0 valid
 H_1 invalid
Valid claim
FTR the claim

Dec 6-9:22 AM

I claim the mean age of all teachers in LAUSD is below 55 yrs.

$\mu < 55$
 H_1

A sample of 10 teachers from LAUSD had a mean age of 52.5 yrs with stand. dev. of 7.5 yrs.

$n=10$
 $\bar{x}=52.5$, $S=7.5$

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

$H_0: \mu \geq 55$

$H_1: \mu < 55$ claim, LTT

CTS $t = -1.054$
P-value $P = .160$

T-Test
inpt: **STATS**
 $\mu_0: 55$ H_0
 $\bar{x}: 52.5$
 $S: 7.5$
 $n: 10$
 $\mu < \mu_0$ H_1
Calculate

σ unknown
CV t LTT $\alpha=.1$
 $df = n-1 = 9$

$t = \text{invT}(.1, 9)$

CTS is in NCR H_0 valid
P-value $> \alpha$ $\Rightarrow H_1$ invalid

Invalid claim
Reject the claim

Dec 6-9:35 AM