Statistics

Lecture 21

Feb 19-8:47 AM

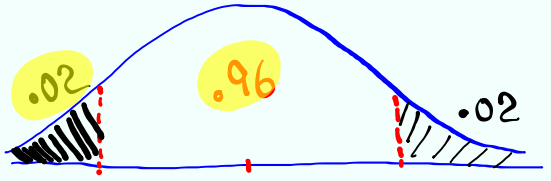
SG 21

Find $\pm z_{\alpha/2}$ for 96% confidence level.

Middle Area = .96

$1-\alpha = .96$

$\alpha = .04$ Sig. level



$-z_{\alpha/2}$ $\mu = 0$ $z_{\alpha/2} = \text{invNorm}(.98, 0, 1) = 2.054$

$\sigma = 1$

-2.054 2.054

Nov 17-10:38 AM

I surveyed 275 students and 16% of them had a full-time job while going to school.

$n = 275$, $\hat{p} = .16$ $\Rightarrow x = n\hat{p} = 275(.16) = 44$

if decimal $\rightarrow$ Round-up

Find 90% Conf. interval for the prop. of all students that have a full-time job.

C-level: .9

1-PropZInt

$x = 44$

$n = 275$

C-level: .9

$E = \frac{.20 - .12}{2} = .04$

$\hat{p} = \frac{.20 + .12}{2} = .16$

$.12 < p < .20$

$\hat{p}$ was 2-dec.

So we round to 2-dec

we are 90% Confident that between 12% & 20% of all students have a full-time job.

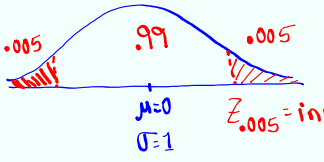
Nov 17-10:43 AM

What is the minimum Sample Size needed if we wish to have 99% Conf. interval for the prop. of all students that have a full-time job if we want error not to exceed 5%? $n = ?$ C-level: .99, $E = .05$

$\hat{p} = .16$, $\hat{q} = 1 - \hat{p} = .84$

$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2 = (.16)(.84)\left(\frac{2.576}{.05}\right)^2 = 356.739\ldots$

≈ 357



$z_{.005} = \text{invNorm}(.995, 0, 1) = 2.576$

Suppose $\hat{p}$ & $\hat{q}$ are unknown

$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.576}{.05}\right)^2 = 663.5776$

≈ 664

Sec 2.1

Nov 17-10:51 AM

Estimating Population Mean μ

Sec 22

Answer ... $< \mu <$ ...

Format $\bar{x} - E < \mu < \bar{x} + E$

$\bar{x}$: Sample Mean, Point-estimate

E: Margin of error

Case I: σ Known

$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$

C.V. $z_{\alpha/2}$ → invNorm

Conf. interval → ZInterval
inpt: Stats

Nov 17-11:02 AM

Given: $n = 35$, $\bar{x} = 82$, $\sigma = 10$

Find 98% Conf. interval for pop. mean.

Since σ is known, use ZInterval

STAT → TESTS → ZInterval

inpt: Stats
$\sigma = 10$
$\bar{x} = 82$
$n = 35$
C-level: .98
Calculate

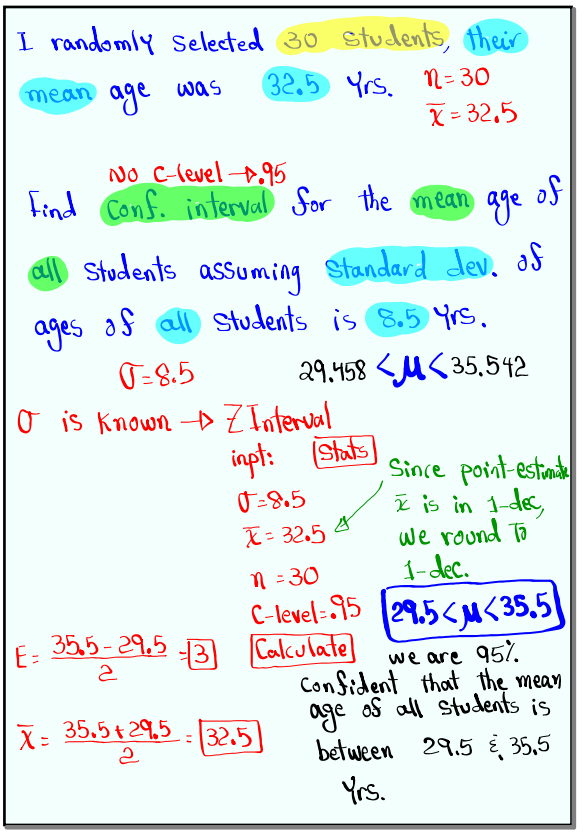
$78.068 < \mu < 85.932$

Since point-estimate $\bar{x}$ is a whole #, we round to whole #.

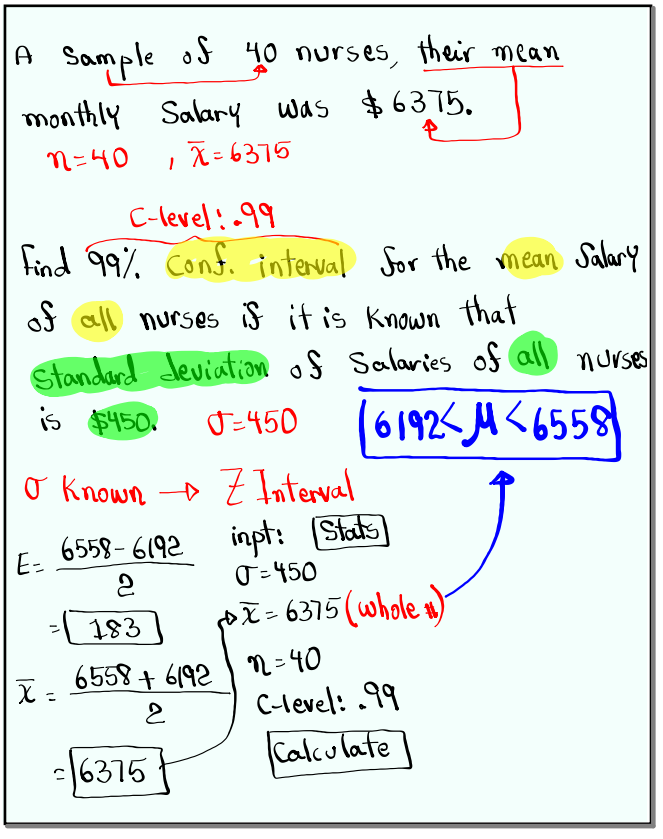
$78 < \mu < 86$

$E = \frac{86 - 78}{2} = 4$ $\quad \bar{x} = \frac{86 + 78}{2} = 82$

Nov 17-11:07 AM



Nov 17-11:14 AM



Nov 17-11:27 AM

Estimating Population Mean μ

Sec 22

Answer ... $< \mu <$ ...

Format $\bar{x} - E < \mu < \bar{x} + E$

$\bar{x}$: Sample Mean, Point-estimate

E: Margin of error

Case I: σ Known	Case II: σ unknown
$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$	$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$
C.V. $z_{\alpha/2}$ → invNorm	C.V. → $t_{\alpha/2}$ → inv T df = n − 1
Conf. interval → ZInterval input: Stats	Conf. interval → TInterval input: STATS

Nov 17-11:02 AM

Given $n = 15$ $\bar{x} = 86$ $s = 12$

Find 90% Conf. interval for population mean

$< \mu <$

Since σ is unknown

we use TInterval

input Stats

$\bar{x} = 86$ (whole)

$s = 12$

$n = 15$ → df = n − 1 = 14

C-level = .9

Calculate

$81 < \mu < 91$

Nov 17-11:41 AM

I randomly Selected 12 exams, their mean was 84.5 with Standard dev. of 8.2.

$n=12$, $\bar{x}=84.5$, $S=8.2$

no C-level → .95

Find Conf. interval for mean Score of all exams.

$79.3 < \mu < 89.7$

σ is unknown

⇒ TInterval

inpt: STATS

$\bar{x}=84.5$ (1-dec.)

$S=8.2$

$n=12$

C-level: .95

Calculate

$E=\frac{89.7-79.3}{2}$

$=5.2$

$\bar{x}=\frac{89.7+79.3}{2}$ 84.5

$df=n-1=11$

Nov 17-11:47 AM

I took a Sample of 10 Students. Here are their ages:

23	25	18	20	30
32	38	19	24	30

use calc to find $\bar{x}$ & S. Round to whole #.

$\bar{x}=26$

$S=6$

Find 99% Conf. interval for the mean age of all Students

$20 < \mu < 32$

σ unknown → TInterval

inpt: Stats

$\bar{x}=26$ (whole)

$S=6$

$n=10$

C-level = .99

Calculate

$E=\frac{32-20}{2}$

$=6$

$\bar{x}=\frac{32+20}{2}$

$=26$

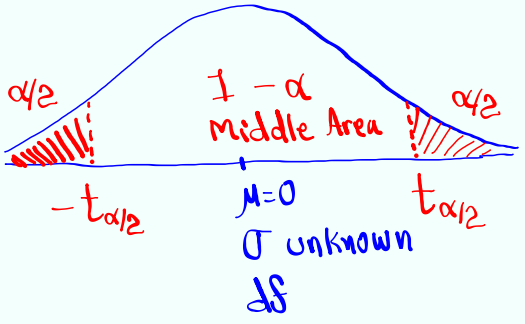
Nov 17-11:57 AM

t - Dist:

1) It is symmetric, bell-shape with total area = 1.

2) $\mu = 0$, σ unknown

3) It comes with degrees of freedom. (df)



How to find $t_{\alpha/2}$:

use

invT(Left Area, df)

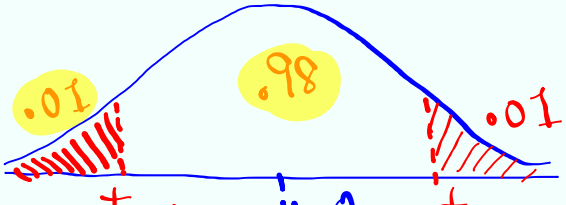
Nov 17-12:05 PM

Find $t_{.01}$ with df = 11.

→ Right-Tail Area

$\alpha/2 = .01 \rightarrow \boxed{\alpha = .02}$

$1 - \alpha = .98 \rightarrow$ C-level: 98%



-2.718

$t_{.01} = \text{invT}(.99, 11) = \boxed{2.718}$

Nov 17-12:10 PM

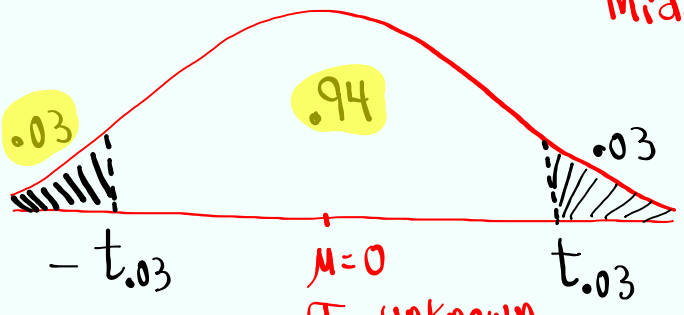
Find $\pm t_{\alpha/2}$ for 94% C-level with df=24.

Middle Area = .94

$1-\alpha = .94$

$\alpha = .06$

$\alpha/2 = .03$



$\mu = 0$

σ unknown

df = 24

$= invT(.97, 24) = 1.974$

-1.974

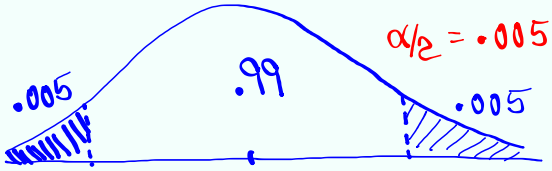
Nov 17-12:15 PM

Find $\pm t_{\alpha/2}$ for $\alpha = .01$ and df = 999.

$1-\alpha = .99$ Middle Area

.99 = 99% C-level

$\alpha/2 = .005$ Area on each tail



$\mu = 0$

σ unknown

df = 999

$= invT(.995, 999) = 2.581$

As df increases,

$t_{\alpha/2} \approx z_{\alpha/2}$

Nov 17-12:19 PM

What is degrees of freedom?

It is a value given to us by the problem or can be determined by certain methods by topics.

20 students, I bring 20 donuts.

You can have one donut.

First	Student	20 choices (20 Donuts)
Second	"	19 " (19 Donuts)
Third	"	18 " (18 Donuts)
⋮		
Last Student		0 choice (1 Donut)

$df = 19$

Nov 17-12:25 PM

7 clean shirts, You only wear a clean shirt

Monday	7 choices
Tuesday	6 "
Wednesday	5 "
⋮	
Sunday	0 choice (1 clean shirt Available)

$df = 7 - 1 = \boxed{6}$

Nov 17-12:30 PM