Statistics

Lecture 21

Feb 19-8:47 AM

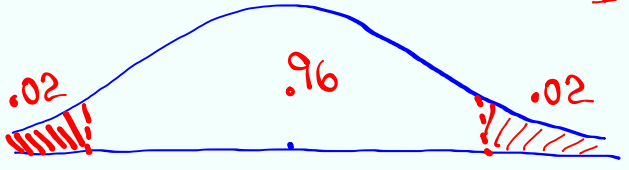
Find $\pm z_{\alpha/2}$ for 96% Conf. level.

Middle Area .96

$1 - \alpha = .96$

$\alpha = .04$

$\alpha/2 = .02$



-2.054

$z_{.02} = \text{invNorm}(.98, 0, 1)$

2.054

May 5-1:49 PM

In a survey of 475 drivers, 32% of them had texted while driving.

$n = 475$ $\quad x = n\hat{p}$ $\quad x = 475(.32) = 152$

$\hat{p} = .32$ $\quad$ if decimal $\Rightarrow$ Round-up

Find **Conf. interval** for the **proportion of all** drivers that have texted while driving.

↳ No C-level $\Rightarrow$ use .95

$\quad < p <$

1-PropZInt

$x = 152$

$n = 475$

C-level = .95

Calculate

$.28 < p < .36$ we are 95% confident that between 28% and 36% of all drivers have texted while driving.

$E = \frac{.36 - .28}{2} = .04$

$\hat{p} = \frac{.36 + .28}{2} = .32$

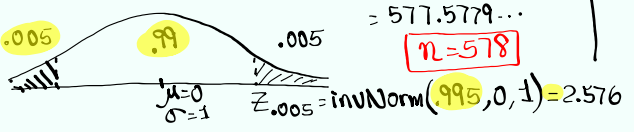
May 5-1:53 PM

how many drivers should we survey if we wish to have Conf. interval @ 99% level and error not to exceed 5%?

$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2 = (.32)(.68)\left(\frac{2.576}{.05}\right)^2$

$= 577.5779\ldots$

$n = 578$



Suppose $\hat{p}$ & $\hat{q}$ were both unknown,

use .5 for each

$n = (.5)(.5)\left(\frac{2.576}{.05}\right)^2 = 663.5776$

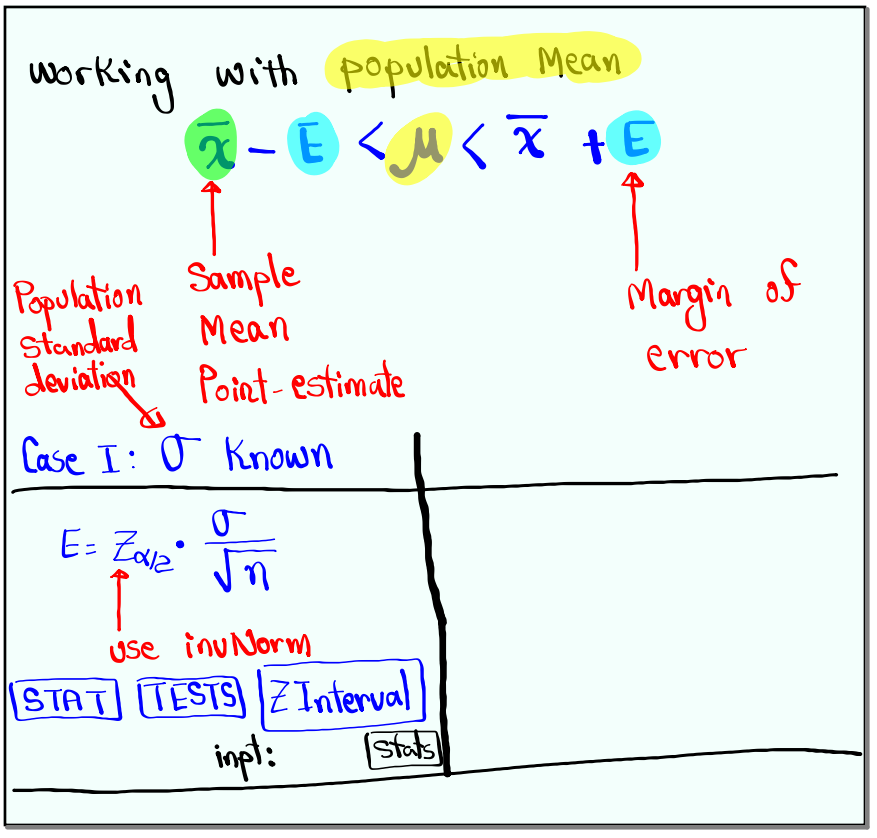
$n = 664$

when working with proportion

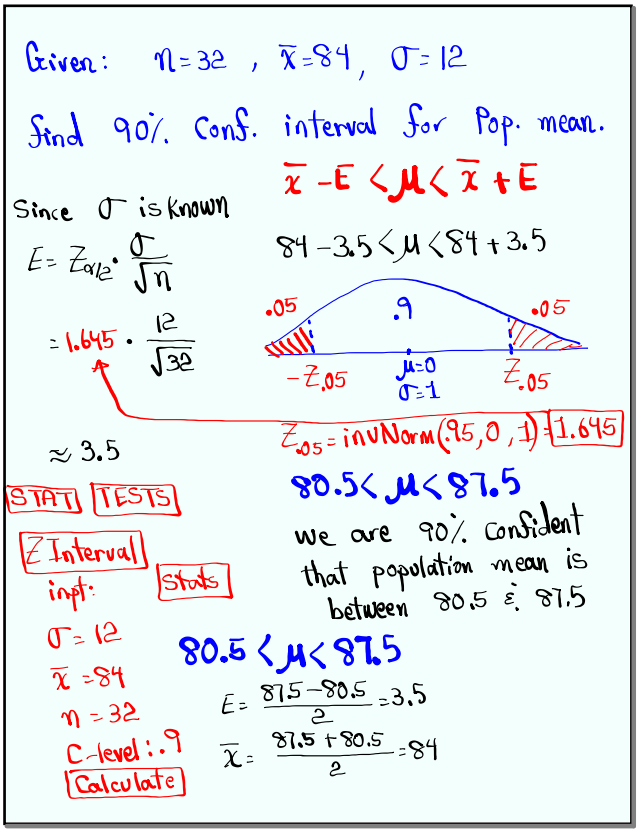
1) use invNorm to find $z_{\alpha/2}$.

2) use 1-PropZInt to find Conf. interval

May 5-2:02 PM



May 5-2:11 PM



May 5-2:15 PM

I randomly selected 28 exams and the mean score was 88.

$n = 28$

$\bar{x} = 88$

Find 98% Conf. interval for the mean of all exams if standard deviation of scores of all exams is known to be 15.

C-level: .98

$\sigma = 15$

Since σ is known we use Z Interval

$\_\_ < \mu < \_\_$

input: [Stats]

$\sigma = 15$

$\bar{x} = 88$

$n = 28$

C-level: .98

$81 < \mu < 95$

we are 98% Confident that the mean score of all exams will be between 81 & 95.

$E = \frac{95 - 81}{2} = 7$

$\bar{x} = \frac{95 + 81}{2} = 88$

May 5-2:26 PM

working with population Mean

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

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

E: Margin of error

σ: Population Standard deviation

Case I: σ Known	Case II: σ unknown
$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$	$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$
use invNorm	$\rightarrow df = n - 1$
STAT TESTS ZInterval	use invT
input: [Stats]	STAT TESTS TInterval
	input: [Stats]

May 5-2:11 PM

Given $n=12$, $\bar{x}=34$, $S=8$

C-level: .98

Find conf. interval for pop. mean.

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

$34 - 6 < \mu < 34 + 6$

$28 < \mu < 40$

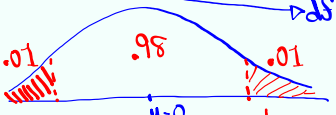
σ unknown

$E = t_{\alpha/2} \cdot \frac{S}{\sqrt{n}} = 2.718 \cdot \frac{8}{\sqrt{12}} \approx 6$

$E = \frac{40-28}{2} = 6$

$\bar{x} = \frac{40+28}{2} = 34$

$df = n-1 = 12-1 = 11$



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

STAT → TESTS → T Interval

inpt: Stats

$\bar{x}=34$

$S=8$

$n=12$

C-level: .98

$28 < \mu < 40$

May 5-2:38 PM

I randomly selected 10 people, the mean of their credit scores was 780 with standard deviation of 35.

$n=10$, $\bar{x}=780$, $S=35$

$df = n-1 = 9$

σ unknown

Find conf. interval for the mean credit score of all people.

No C-level → use .95

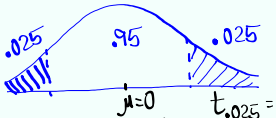
σ unknown → T Interval

$755 < \mu < 805$

$E = \frac{805-755}{2} = 25$

$\bar{x} = \frac{805+755}{2} = 780$

Find $\pm t_{\alpha/2}$ for 95% C-level with $df=9$



$t_{.025} = \text{invT}(.975, 9) = 2.262$

If your calc does not have invT command ⇒ Download G.Calculator App.

May 5-2:47 PM

I surveyed 15 students. Here are their ages:

28	32	18	25	40
20	35	19	30	48
52	38	24	18	26

Store in L1

Find $\bar{x}$ & S.

Round to whole #

$\bar{x} = 30.2 \approx 30$

$S = 10.658 \approx 11$

$n = 15 \rightarrow df = 14$

Find 90% Conf. interval for the mean age of all students.

σ Unknown

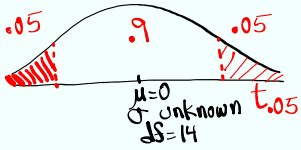
use [TInterval]

$E = \frac{35 - 25}{2} = 5$

$\bar{x} = \frac{35 + 25}{2} = 30$

$25 < \mu < 35$

Find $\pm t_{\alpha/2}$ for 90% C-level with df = 14



$t_{.05} = \text{invT}(.95, 14) = 1.761$

May 5-2:58 PM

How to determine minimum Sample Size needed for pop. mean:

$E = Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} \Rightarrow n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2$

Always round-up

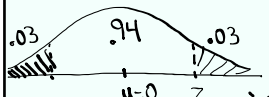
if σ unknown → use S.

From last example,

find min. Sample Size needed if we wish 94% C-level and error not to exceed 10.

$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.881 \cdot 11}{10}\right)^2$

$= 4.28 \approx n = 5$



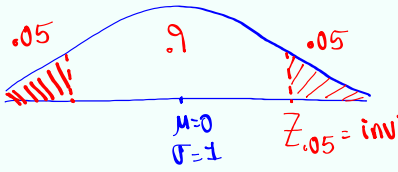
$Z_{.03} = \text{invNorm}(.97, 0, 1) = 1.881$

Redo with E = 5

$n = \left(\frac{1.881 \cdot 11}{5}\right)^2 \approx 18$

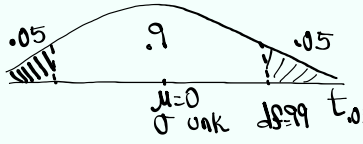
May 5-3:08 PM

Find $z_{\alpha/2}$ for 90% C-level.



$z_{.05} = \text{invNorm}(.95, 0, 1) = 1.645$

Find $t_{\alpha/2}$ for 90% C-level with df=99.



$t_{.05} = \text{invT}(.95, 99) = 1.660$

Find $t_{\alpha/2}$ for 90% C-level with df=999

Same drawing $t_{.05} = \text{invT}(.95, 999) = 1.646$

As df gets bigger & bigger

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

May 5-3:18 PM

I randomly selected 20 exams. Here are the scores:

80	75	100	92	98
68	55	65	72	70
88	100	95	95	90
82	78	93	67	50

Find

$\bar{x} \approx 81$

$s \approx 15$

Round to whole #'s

Find Conf. interval for the mean of all exams

C-level: .95

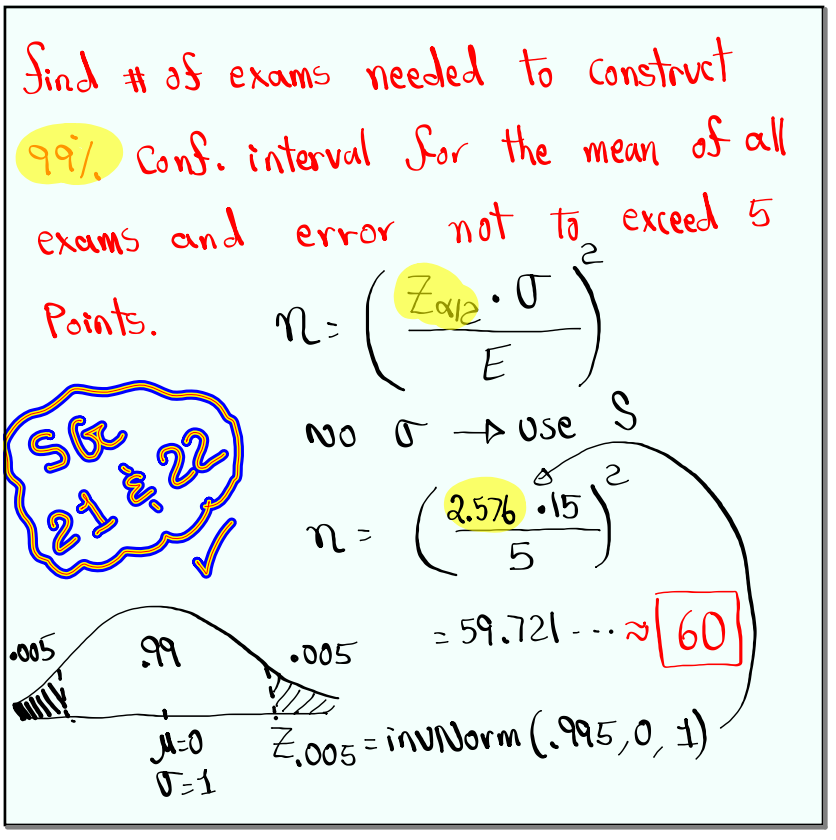
σ unknown → T Interval

$74 < \mu < 88$

$E = \frac{88-74}{2} = 7$

$\bar{x} = \frac{88+74}{2} = 81$

May 5-3:25 PM


Find # of exams needed to construct 99% Conf. interval for the mean of all exams and error not to exceed 5 Points.
$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$
SG: 21 ± 22 ✓
no σ → use s
$n = \left(\frac{2.576 \cdot 15}{5}\right)^2$
$= 59.721\ldots \approx 60$
.005
.99
.005
$\mu = 0$
$\sigma = 1$
$z_{.005} = \text{invNorm}(.995, 0, 1)$

May 5-3:31 PM