Statistics

Lecture 23

Feb 19-8:47 AM

Class QZ 14

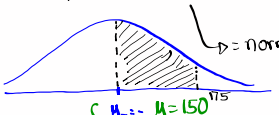
Given $N(150, 25)$ $\mu = 150$ $\sigma = 25$ $n = 4$

For random 4 selected groups of 4 find

1) $\mu_{\bar{x}} = \mu = 150$ CLT

2) $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{4}} = \frac{25}{2} = 12.5$ CLT

3) $P(150 < \bar{x} < 175)$ Drawing, labeling, shading, TI Command required.



normalcdf(150, 175, 150, 12.5)

$= .477 = 47.7\% \approx 48\%$

CLT $\mu_{\bar{x}} = \mu = 150$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = 12.5$

Nov 30-7:02 AM

Class QZ 13:

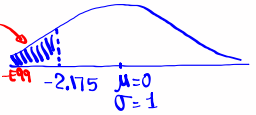
Drawing, labeling, shading, and full TI command required.

1) Find twice the area to the left of $Z = -2.175$.

2nd normalcdf(−E99, −2.175, 0, 1)

$= .0296$

$\approx .030$ ✓

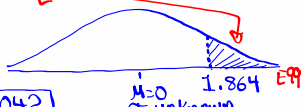


2) Find the area to the right of $t = 1.864$ with $df = 14$.

tcdf(1.864, E99, 14) = .042

(Lower, upper, df)

2nd VARS



Nov 29-9:27 AM

In a survey of 835 LA residents, 72% of them were fan of LA Lakers. $n = 835$ $\hat{p} = .72$

1) How many of them (x) were fan of LA Lakers?

$x = n\hat{p} = 835(.72) = 601.2 \rightarrow x = 602$

if decimal → Round-up

2) Find confidence interval for the prop. of all LA residents that are fan of LA Lakers.

NO C-level ⇒ use .95

1-PropZInt

$x = 602$

$n = 835$

C-level: .95

$.691 < p < .751$

$.69 < p < .75$

we are 95% confident that between 69% & 75% of all LA residents are fan of LA Lakers.

$E = \frac{.75 - .69}{2} = .03$

$\hat{p} = \frac{.75 + .69}{2} = .72$

Nov 30-7:45 AM

In a Sample of 32 Cars on certain Freeway, their mean Speed was 76.5 mph.

$n=32$, $\bar{x}=76.5$

It is known that Standard deviation of speed of all Cars on that Freeway is 8.2 mph. $\sigma=8.2$

Find 99% Conf interval for the mean Speed of all Cars on that Freeway.

C-level: .99

$72.766 < \mu < 80.234$

If σ Known $\Rightarrow$ Z Interval

If σ Unknown $\Rightarrow$ T Interval

inpt: Stats

$\sigma=8.2$

$\bar{x}=76.5$

$n=32$

C-level: .99

1-decimal

$72.8 < \mu < 80.2$

$E = \frac{80.2 - 72.8}{2} = 3.7$

$\bar{x} = \frac{80.2 + 72.8}{2} = 76.5$

we are 99% Confident that mean speed of all Cars are between 72.8 & 80.2 mph.

Nov 30-7:55 AM

I randomly Selected 8 students, here are their ages

32	25	20	40
38	18	24	30

Clear all lists

Store this Sample in L1

Use 1-Var Stats with L1 to find

$\bar{x} \approx 28.4$

$s \approx 8.0$

$s^2 = \frac{3615}{56}$

} Round to 1-decimal

Reduced fraction

using the rounded answers, Find 90% Conf. interval for the mean age of all students.

If σ Known $\Rightarrow$ Z Interval

If σ Unknown $\Rightarrow$ T Interval

inpt: Stats

$\bar{x}=28.4$

$s=8.0$

$n=8$

C-level: .9

$23.0 < \mu < 33.8$

1-decimal

$E = \frac{33.8 - 23.0}{2} = 5.4$

$\bar{x} = \frac{33.8 + 23.0}{2} = 28.4$

we are 90% Confident that the mean age of all students is between 23.0 & 33.8 yrs.

Nov 30-8:07 AM

Minimum Sample Size needed to Construct Confidence interval for

1) Population Proportion

$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$ → with Some Algebra Work → $n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$

If decimal ⇒ Round-up

If $\hat{p}$ & $\hat{q}$ are unknown ⇒ "use .5 for each" ⇒ $n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2$

Nov 30-8:37 AM

Find minimum Sample Size needed to construct 96% Conf. interval for pop. proportion and error not to exceed 5% if

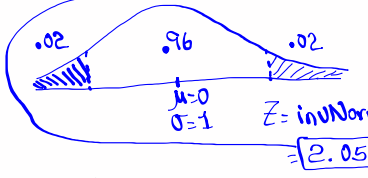
1) $\hat{p} = .6$

$\hat{q} = 1 - \hat{p} = 1 - .6 = .4$

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

$= (.6)(.4)\left(\frac{2.054}{.05}\right)^2$

$= 405.016 \rightarrow 406$



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

$= 2.054$

2) $\hat{p}$ & $\hat{q}$ unknown

$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.054}{.05}\right)^2 = 421.892$

≈ 422

Nov 30-8:42 AM

Find n minimum Sample Size needed if we wish to have 99% C-level for conf. interval for Pop. Proportion and error not to exceed 4% if

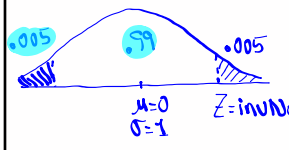
1) $\hat{P} = .35$

$\hat{q} = 1 - \hat{P} = .65$

$n = \hat{P}\hat{q}\left(\frac{Z_{\alpha/2}}{E}\right)^2$

$= (.35)(.65)\left(\frac{2.576}{.04}\right)^2$

$= 943.5244 \approx 944$ Round-up



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

2) $\hat{P}$ & $\hat{q}$ are unknown

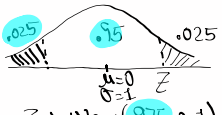
$n = .25\left(\frac{Z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.576}{.04}\right)^2 = 1036.84 \approx 1037$ Round-up

Let's redo with C-level .95 & $E = 8\%$.

$n = .25\left(\frac{1.960}{.08}\right)^2$

$= 150.0625$

≈ 151



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

$= 1.960$

Nov 30-8:50 AM

Minimum Sample Size needed to Construct Confidence interval for

1) Population Proportion

$E = Z_{\alpha/2} \cdot \sqrt{\frac{\hat{P}\hat{q}}{n}}$ with Some Algebra Work $\Rightarrow$ $n = \hat{P}\hat{q}\left(\frac{Z_{\alpha/2}}{E}\right)^2$

If decimal $\Rightarrow$ Round-up

If $\hat{P}$ & $\hat{q}$ are unknown "use .5 for each" $\Rightarrow$ $n = .25\left(\frac{Z_{\alpha/2}}{E}\right)^2$

2) Population Mean

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

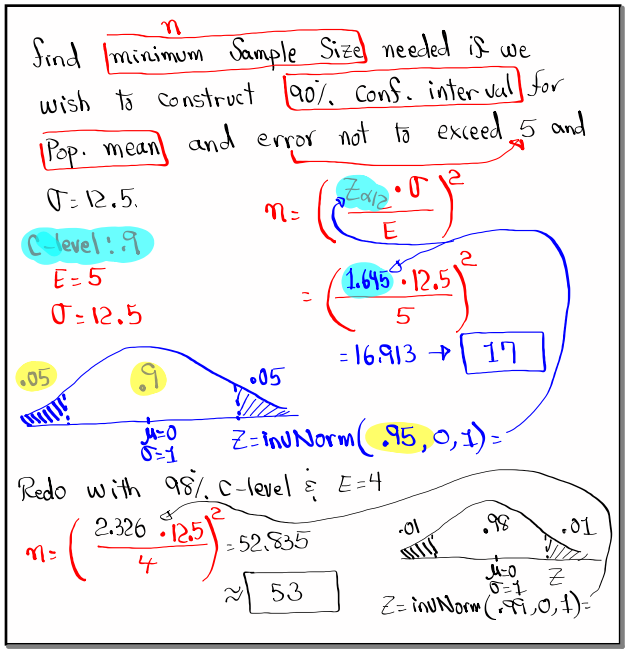
If decimal $\Rightarrow$ Round-up

If σ is unknown $\Rightarrow$ use S

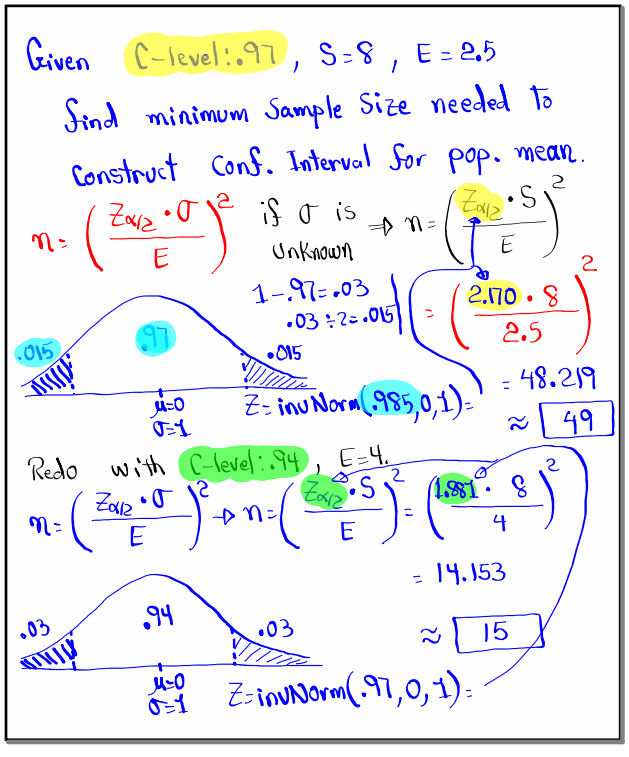
Sample Standard Deviation

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

Nov 30-8:37 AM



Nov 30-9:09 AM



Nov 30-9:19 AM

What is degrees of freedom?

You determine df by its topic.

Think of # of choices

There are 12 Students. I bring them 12 donuts. First Person → 12 choices

Second " → 11 choices

Third " → 10 "

⋮

(Bryan) Last " → (No choice) 1 Donut left

df = 12 − 1 = 11

Bryan has 7 clean shirt to wear. df = 6

Monday → 7 choices

Tuesday → 6 "

Wednesday → 5 "

⋮

Sunday (No choice) 1 clean shirt.

Nov 30-9:30 AM

Find $t_{\alpha/2}$ for 90% C-level with df = 8.

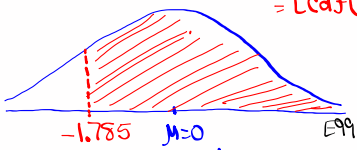
$t_{.05} = \text{invT}(\text{Left Area}, \text{df}) = \text{invT}(.95, 8) = 1.860$

Nov 30-9:36 AM

Find $P(t > -1.785)$ with $df = 14$.

$= tcdf(-1.785, E99, 14)$

Lower upper df

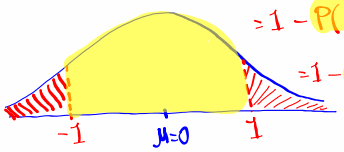


$= .952$

Find $P(t < -1 \text{ OR } t > 1)$ with $df = 19$.

$= 1 - P(-1 < t < 1)$

$= 1 - tcdf(-1, 1, 19)$

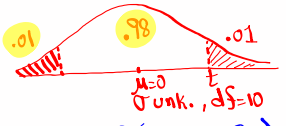


$= .330$

Nov 30-9:39 AM

Class QZ 15

1) Find $t_{\alpha/2}$ for 98% C-level with $df = 10$.

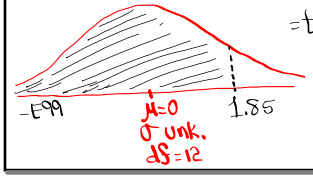


$t_{\alpha/2} = invT(.99, 10)$

$= 2.764$

2) Find $P(t < 1.85)$ with $df = 12$.

$= tcdf(-E99, 1.85, 12)$



$= .955$

Nov 30-9:46 AM