Statistics

Lecture 12

Feb 19-8:47 AM

I Surveyed 355 Students and 42% of them were in favor of True-False exams. SG 21

$n = 355$ $\quad x = n\hat{p} = 355(.42) = 149.1 \rightarrow x = 150$

$\hat{p} = .42$ $\quad$ if decimal → Round-up

Find Conf. interval for the proportion of all Students that are in favor of True-False exams.

↳ NO C-level → .95

1-PropZInt

$x = 150$

$n = 355$

C-level = .95

Calculate

$E = \frac{.47 - .37}{2} = .05$

$\hat{p} = \frac{.47 + .37}{2} = .42$

$.37 < p < .47$

we are 95% Confident that between 37% & 47% of all students are in favor of True/False exams.

Nov 14-11:37 AM

Find minimum Sample Size needed to Construct 99% Conf. interval for propor. of all Students that are in favor of True/False exams if we wish the error not to exceed 4%.

$n = ?$

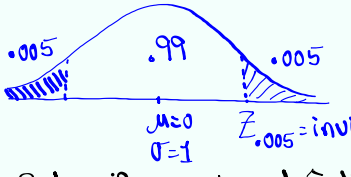
C-level: .99

$E = .04$

$\hat{p}, \hat{q}$?

$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$ if decimal, round-up

$n = (.42)(.58)\left(\frac{2.576}{.04}\right)^2 = 1010.29\ldots \approx \boxed{1011}$



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

Redo if $E = .1$ and $\hat{p}$ & $\hat{q}$ are unknown

$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.576}{.1}\right)^2 = 165.8944$

$\approx \boxed{166}$

SG 21 ✓

Nov 14-11:46 AM

Estimating Population Mean μ: SG 22

Answer $\quad \ldots < \mu < \ldots$

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

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

E: Margin of error

Case I: σ Known

C.V. $\rightarrow z_{\alpha/2} \rightarrow$ invNorm

Conf. interval $\rightarrow$ ZInterval

inpt: Stats

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

Nov 14-11:57 AM

Given $n=36$, $\bar{x}=84$ $\sigma=10$

Find 90% Conf. interval for pop. mean μ.

σ is known → Z Interval

STAT | TESTS

inpt: Stats

$\sigma=10$

$\bar{x}=84$

$n=36$

C-level: .9

Calculate

$E=\frac{87-81}{2}=3$

$\bar{x}=\frac{87+81}{2}=84$

$81.259<\mu<86.741$

Since $\bar{x}$ is a whole #, we round to whole #

$81<\mu<87$

Nov 14-12:01 PM

I surveyed 40 students, their mean age was 31.8 yrs. $n=40$ $\bar{x}=31.8$

Find 99% Conf. interval (C-level: .99) for the mean age of all students assuming the standard dev. of ages of all students was 7.5 yrs.

$\sigma=7.5$

$<\mu<$

σ Known → Z Interval

inpt: Stats

$\sigma=7.5$

$\bar{x}=31.8$ ← one decimal

$n=40$

C-level: .99

Calculate

$E=\frac{34.9-28.7}{2}=3.1$

$\bar{x}=\frac{34.9+28.7}{2}=31.8$

$28.7<\mu<34.9$

Nov 14-12:07 PM

Estimating Population Mean μ: (SG 22)

Answer $\quad \cdots < \mu < \cdots$

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

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

E: Margin of error

Case I: σ Known	Case II: σ Unknown
C.V. $\to z_{\alpha/2} \to$ invNorm	C.V. $\to t_{\alpha/2} \to$ invT, $df = n-1$
Conf. interval $\to$ ZInterval, inpt: Stats	Conf. interval $\to$ TInterval, inpt: Stats
$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$	$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$

Nov 14-11:57 AM

Given $n = 18 \quad \bar{x} = 48 \quad s = 8$

NO C-level $\to .95$

Find Conf. interval for population mean μ.

σ is uknown $\to$ TInterval

inpt: Stats

whole # $\to \bar{x} = 48$

$s = 8$

$df = 17 \to n = 18$

C-level: .95

Calculate

$44 < \mu < 52$

Round to whole #

$E = \frac{52-44}{2} = 4$

$\bar{x} = \frac{52+44}{2} = 48$

Nov 14-12:18 PM

I surveyed 20 nurses, their mean monthly salary was \$6450 with standard dev. of \$300. $n=20$ $\bar{x}=6450$ $S=300$

Find 90% Conf. interval (C-level: .9) for the mean salary of all nurses.

$6334 < \mu < 6566$

σ unknown → T Interval

inpt: Stats

$\bar{x}=6450$

$S=300$

$n=20$

C-level: .9

Calculate

$df = n-1 = 19$

$E = \frac{6566-6334}{2} = 116$

$\bar{x} = \frac{6566+6334}{2} = 6450$

Nov 14-12:24 PM

How to find min. Sample Size needed:

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

with Some algebra, Solve for n:

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

if decimal ⇒ Round-up

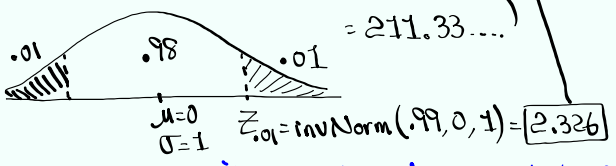
If σ is unknown, use S in place of σ.

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

Nov 14-12:30 PM

Find min. Sample Size needed to construct 98% Conf. interval for Pop. mean if $\sigma = 25$ and $E = 4$.

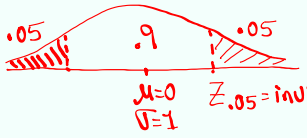
$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{2.326 \cdot 25}{4}\right)^2 = 211.33\ldots \rightarrow \boxed{212}$$



$z_{.01} = \text{invNorm}(.99, 0, 1) = \boxed{2.326}$

Redo with 90% C-level and error to be 10.

$$n = \left(\frac{1.645 \cdot 25}{10}\right)^2 = 16.9\ldots \approx \boxed{17}$$



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

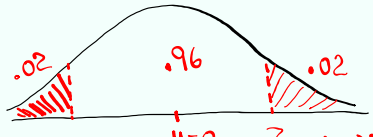
Nov 14-12:34 PM

Given 96% C-level, $S = 18$, $E = 2.5$

find min. Sample Size needed to construct Conf. interval for pop. mean μ.

σ unknown, we use S.

$$n = \left(\frac{z_{\alpha/2} \cdot S}{E}\right)^2 = \left(\frac{2.054 \cdot 18}{2.5}\right)^2 \approx \boxed{219}$$



$z_{.02} = \text{invNorm}(.98, 0, 1) = \boxed{2.054}$

Redo with $E = 7.5$

$$n = \left(\frac{2.054 \cdot 18}{7.5}\right)^2 \approx \boxed{25}$$

✓ SG 22

Nov 14-12:42 PM