Statistics

Lecture 12

Feb 19-8:47 AM

SG 21

I surveyed 275 students and 42% of them were in favor of multiple-choice exams.

$n = 275$

$\hat{p} = .42$

$x = n\hat{p} = 275(.42) = 115.5 \rightarrow x = 116$

if decimal → Round-up

Find 98% Confidence interval for the proportion of all students that like multiple-choice exam.

C-level : .98

$\hat{p} - E < p < \hat{p} + E$

$.35 < p < .49$

1-PropZInt

$x = 116$

$n = 275$

C-level: .98

Calculate

we are 98% Confident that between 35% & 49% of all students like multiple-choice exams.

$E = \frac{.49 - .35}{2} = .07$

$\hat{p} = \frac{.49 + .35}{2} = .42$

Nov 14-8:03 AM

Suppose we like to construct 99% confidence interval for the prop. of all students in favor of multiple-choice exams and error not to exceed 5%, find min. Sample size needed.

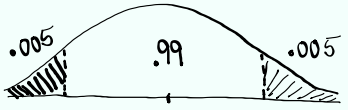
C-level: .99
$E = .05$
$\hat{p} = .42$

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

$= (.42)(.58)\left(\frac{2.576}{.05}\right)^2$

$= 646.59\ldots$

$\approx \boxed{647}$



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

If $\hat{p}$ & $\hat{q}$ were unknown,

$n = .25\left(\frac{2.576}{.05}\right)^2 = 663.5776 \approx \boxed{664}$

SG 21✓

Nov 14-8:14 AM

SG 22

Estimating Population Mean μ:

Final Ans: $\ldots < \mu < \ldots$

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

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

E: Margin of error

Case I: σ known

C.V. → $z_{\alpha/2}$ → invNorm

Conf. Int → ZInterval

Input: Stats

Nov 14-8:23 AM

Given $n=32$, $\bar{x}=85$, $\sigma=12$

Find 90% Conf. interval for Pop. Mean μ

Since σ is known → use Z Interval

STAT → TESTS ↓ ZInterval

inpt: Stats

$\sigma=12$

$\bar{x}=85$

$n=32$

C-level: .9

Calculate

$81.511 < \mu < 88.489$

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

$82 < \mu < 88$

we are 90% confident that pop. means is between 82 and 88.

$E = \frac{88-82}{2} = 3$ $\quad \bar{x} = \frac{88+82}{2} = 85$

Nov 14-8:28 AM

I surveyed 35 students, their mean age was 32.5 yrs. $n=35$ $\bar{x}=32.5$

no C-level → .95

Find Conf. interval for the mean age of all students assuming standard deviation of ages of all students was 7.5 yrs.

$\sigma=7.5$ $\quad < \mu <$

Since σ is known, we use

Z Interval

inpt: STATS

$\sigma=7.5$

$\bar{x}=32.5$

$n=35$

C-level: .95

Calculate

$30.015 < \mu < 34.985$

Since $\bar{x}$ was in 1-dec., we round to 1-dec.

$30.0 < \mu < 35.0$

$E = \frac{35-30}{2} = 2.5$

$\bar{x} = \frac{35+30}{2} = 32.5$

Nov 14-8:35 AM

SG 22

Estimating Population Mean μ:

Final Ans: $\ldots < \mu < \ldots$

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
C.V. $\rightarrow z_{\alpha/2}$ $\rightarrow$ invNorm	C.V. $\rightarrow t_{\alpha/2}$ $\rightarrow$ invT
	df $= n-1$
Conf. Int $\rightarrow$ ZInterval	Conf. Int. $\rightarrow$ TInterval
Inpt: Stats	inpt: Stats

Nov 14-8:23 AM

Given $n = 15$ $\bar{x} = 48$ $S = 10$

Find 98% Conf. interval for pop. mean μ.

Since σ is unknown $\rightarrow$ TInterval

inpt: Stats

$\bar{x} = 48$

$S = 10$

$n = 15$ $\rightarrow$ df $= 14$

C-level: .98

Calculate

$41.224 < \mu < 54.776$

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

$41 < \mu < 55$

$E = \frac{55 - 41}{2} = 7$

$\bar{x} = \frac{55 + 41}{2} = 48$

Nov 14-8:47 AM

I surveyed 20 nurses, their mean monthly salary was \$6250 with standard dev. of \$275. $n=20$ $\bar{x}=6250$ $s=275$

No C-level → .95

Find conf. interval for the mean monthly salary of all nurses.

σ unknown → TInterval

inpt: STATS

$\bar{x}=6250$

$s=275$

$n=20$

C-level: .95

Calculate

df = 20 − 1 = 19

$6121 < \mu < 6379$

$E = \frac{6379-6121}{2} = 129$

$\bar{x} = \frac{6379+6121}{2} = 6250$

Nov 14-8:53 AM

How to determine minimum Sample Size:

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

use Algebra to Solve for n.

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

if decimal → Round-up

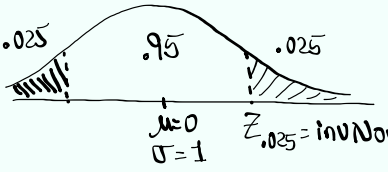
If σ is unknown, use s in place of σ.

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

Nov 14-9:00 AM

Find min. Sample Size needed if we wish to construct 95% Conf. interval for Pop. mean when $\sigma = 25$ and $E = 8$.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.960 \cdot 25}{8}\right)^2 = 37.515625 \approx \boxed{38}$$



$z_{.025} = \text{invNorm}(.975, 0, 1) = \boxed{1.960}$

Redo with $E = 10$.

$$n = \left(\frac{1.960 \cdot 25}{10}\right)^2 = 24.01 \approx \boxed{25}$$

Redo with $E = 4$

$$n = \left(\frac{1.960 \cdot 25}{4}\right)^2 = 150.0625 \approx \boxed{151}$$

Nov 14-9:05 AM

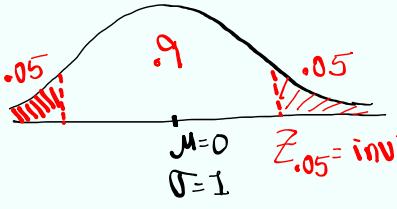
Given $S = 15$, $E = 5$, C-level: .9

Find min. Sample Size needed to construct conf. interval for pop. mean.

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

Since σ is unknown

$$n = \left(\frac{z_{\alpha/2} \cdot s}{E}\right)^2 = \left(\frac{1.645 \cdot 15}{5}\right)^2 = 24.35\ldots \approx \boxed{25}$$



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

SG 22v

Nov 14-9:14 AM