Statistics

Spring 2023

Lecture 45

Feb 19-8:47 AM

Suppose $x = 72$, $n = 200$

1) $\hat{p} = \dfrac{x}{n} = \dfrac{72}{200} = \boxed{.36}$
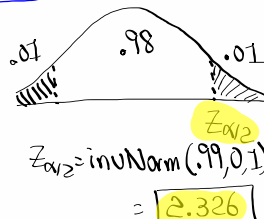
2) $\hat{q} = 1 - \hat{p} = 1 - .36 = \boxed{.64}$

3) Find minimum Sample Size needed if we wish to construct $\boxed{98\% \text{ conf. interval}}$ for pop. proportion and $\boxed{\text{error not to exceed } 5\%}$

a) use $\hat{p}$ found above.

$n = \hat{p}\,\hat{q}\left(\dfrac{Z_{\alpha/2}}{E}\right)^2$ $\boxed{n = 499}$

$= (.36)(.64)\left(\dfrac{2.326}{.05}\right)^2 = 498.611$

$Z_{\alpha/2} = \text{invNorm}(.99, 0, 1)$

$= \boxed{2.326}$

b) Assume $\hat{p}$ & $\hat{q}$ are unknown.

Use .5 for each

$n = .25\left(\dfrac{Z_{\alpha/2}}{E}\right)^2 = .25\left(\dfrac{2.326}{.05}\right)^2 = 541.0276$

$\boxed{n = 542}$

May 4-7:17 AM

Given $\bar{x} = 175$, $\sigma = 25$

Find minimum Sample Size needed to construct 99% conf. interval for population mean and error not to exceed 10 units.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{2.576 \cdot 25}{10}\right)^2 = 41.4736$$

$$\boxed{n = 42}$$

.005   .99   .005

$z_{\alpha/2} = \text{invNorm}(.995, 0, 1) = \boxed{2.576}$

let's redo for 90% C-level ε, $E = 5$

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.645 \cdot 25}{5}\right)^2 = 67.650625$$

$$\boxed{n = 68}$$

.05   .9   .05

$z_{\alpha/2}$

$z_{\alpha/2} = \text{invNorm}(.95, 0, 1) = \boxed{1.645}$

May 4-7:27 AM

Given $\bar{x} = 175$, $S = 30$

Find minimum Sample Size needed to construct conf. interval for pop. mean and error not to exceed 10 units.

→ NO C-level ⇒ Use 95%

when σ is not given, we use S instead.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 \Rightarrow n = \left(\frac{z_{\alpha/2} \cdot S}{E}\right)^2 = \left(\frac{1.960 \cdot 30}{10}\right)^2$$

.025   .95   .025

$z_{\alpha/2}$

$= 34.5744$

$$\boxed{n = 35}$$

SG 22 & 23

$z_{\alpha/2} = \text{invNorm}(.975, 0, 1) = \boxed{1.960}$

Redo with $E = 5$

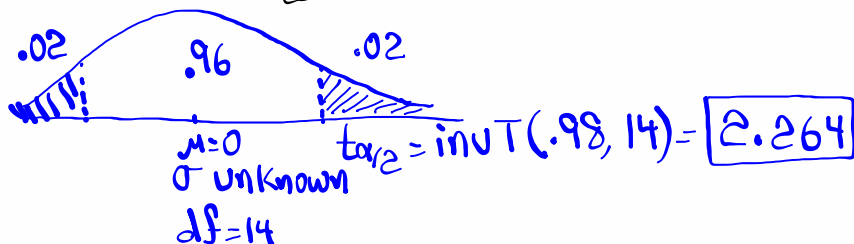$$n = \left(\frac{z_{\alpha/2} \cdot S}{E}\right)^2 = \left(\frac{1.960 \cdot 30}{5}\right)^2 = 138.2976 \quad \boxed{n = 139}$$

May 4-7:35 AM

Class QZ 12

Drawing, labeling, shading, TI command required

1) find $t_{\alpha/2}$ for 96% C-level with $df = 14$.

.02 .96 .02

$\mu = 0$
σ unknown
$df = 14$

$t_{\alpha/2} = \text{inv}T(.98, 14) = \boxed{2.264}$

2) find the area to the left of $\chi^2 = 3.25$ with $df = 10$.

$\chi^2 cdf(0, 3.25, 10) = \boxed{.025}$

0   3.25

May 4-7:44 AM