Statistics
Fall 2022
Lecture 11

Feb 19-8:47 AM

Class QZ 11

Consider a | geometric Prob. dist | with | p=.5

1) $P(x = 3)$ = geometpdf(.5, 3) = .125 ✓

2) $P(x > 3) = P(x \geq 4) = 1 - P(x \leq 3)$
$= 1 - \text{geometcdf}(.5, 3) = .125$ ✓✓

Nov 1-9:13 PM

College randomly selected 185 students and 6% of them were left-handed.

$n=185$ $\hat{p}=.06$ $\Rightarrow x=n\hat{p}=185(.06)=11.1 \Rightarrow x=12$

is decimal $\Rightarrow$ Round-up

Find 99% Conf. interval for the prop. of all students that are left handed.

↳ C-level: .99

1-PropZInt
$x=12$
$n=185$
C-level: .99

$.018 < p < .112$

We are 99% confident that between 2% & 11% of all students are left-handed.

$E=\frac{.112-.018}{2}=.047$

$\hat{p}=\frac{.112+.018}{2}=.065$

Point-estimate

Nov 8-6:53 PM

I randomly selected 32 nurses and their mean age was 41.5 yrs.

$n=32$
$\bar{x}=41.5$

It is known that standard deviation of ages of all nurses is 8.6 yrs.

$\sigma=8.6$

Find Conf. interval for the mean age of all nurses

$38.5<\mu<44.5$

↳ No C-level $\Rightarrow$ use .95

We are 95% confident that the mean age of all nurses is between 38.5 & 44.5 yrs

If σ known $\Rightarrow$ ZInterval → Inpt: Stats
If σ unknown $\Rightarrow$ TInterval

σ: 8.6
$\bar{x}=41.5$ ← Point-estimate
$n=32$
C-level: .95

$E=\frac{44.5-38.5}{2}=3$

$\bar{x}=\frac{44.5+38.5}{2}=41.5$

Nov 8-7:01 PM

20 randomly selected exams had a mean of 85 and standard deviation of 10.

$n=20$, $\bar{x}=85$, $s=10$

Find 98% Conf. interval for the mean of all exams.

$79.322<\mu<90.678$

$79<\mu<91$

↳ C-level: .98

σ known ⇒ Z Interval

σ unknown ⇒ T Interval ⇒ Inpt: STATS

$\bar{x}=85$ ← Point-estimate

$s=10$

$n=20$ ← df: $n-1=19$

C-level: .98

$E=\frac{91-79}{2}=6$

$\bar{x}=\frac{91+79}{2}=85$

Nov 8-7:10 PM

I randomly selected 12 students, here are their ages:

28	18	30	42
25	20	32	38
19	50	24	36

Find

$\bar{x}=30.2$

$s=9.9$

} Round to 1 decimal

$n=12$

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

$23.91<\mu<36.49$

$23.9<\mu<36.5$

↳ NO C-level ⇒ use .95

σ known ⇒ Z Interval

σ unknown ⇒ T Interval

Inpt: stats

$\bar{x}=30.2$ ← Point-estimate

$s=9.9$

$n=12$ ← df: $n-1=11$

C-level: .95

$E=\frac{36.5-23.9}{2}=6.3$

$\bar{x}=\frac{36.5+23.9}{2}=30.2$

Nov 8-7:18 PM

How to determine minimum Sample Size when constructing Conf. interval:

1) Working with proportion

$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$ $\Rightarrow$ with some algebra work

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

If decimal $\Rightarrow$ Round-up

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

2) Working with mean

$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$ $\Rightarrow$ with some algebra work

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

is decimal $\Rightarrow$ round-up

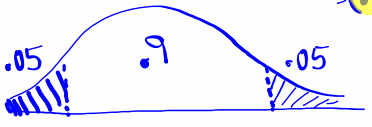
If σ is unknown use s instead of σ $n = \left(\frac{z_{\alpha/2} \cdot s}{E}\right)^2$

Nov 8-7:28 PM

Find minimum Sample Size needed if we wish to construct 90% Conf. interval for Pop. proportion with margin of error not to exceed 4% and

1) $\hat{p} = .7$

$\hat{q} = 1 - \hat{p} = .3$



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

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

$= (.7)(.3)\left(\frac{1.645}{.04}\right)^2$

$= 355.1657\ldots$

$n = 356$

2) $\hat{p}$ & $\hat{q}$ unknown $n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2$

$= .25\left(\frac{1.645}{.04}\right)^2$

$= 422.816\ldots$

$n = 423$

Nov 8-7:37 PM

Find min. Sample Size needed to Construct 99% Conf. interval for Pop. mean if we wish the margin of error not to exceed 8 and Standard deviation of all is 15.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{2.576 \cdot 15}{8}\right)^2$$

$= 23.3289$

$n = 24$

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

Nov 8-7:44 PM

Standard deviation of scores of randomly selected exam was 12. $S = 12$

Find min. Sample Size needed if we wish to construct 98% Conf. interval for the mean of all exams and error not to exceed 5. If σ unknown, use S

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

$$= \left(\frac{2.326 \cdot 12}{5}\right)^2$$

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

$= 31.163$

$n = 32$

SG 22 & SG 23

Exam II: If Your work is not Similar to my notes $\Rightarrow$ I consider it cheating.

Final Submission $\Rightarrow$ One file, Pages in order, Portrait style, PDF or JPG file.

Hand-writing exams
No need to write the actual Problem
Page-Per-Page contents
Answers in designated area.

Nov 8-7:50 PM