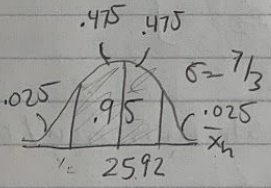
Himanshu Rana
2/25
MA 331 Hw 4
"I pledge my honor that I have abided by the Stevens Honor System" - [signature]

1) a) population average – not random variable because the population is not changing when we sample
b) Sample mean – is a random variable because its value depends on what the random sample will be
c) (true) variance of sample mean – is a random variable because it is a function being applied to another RV
d) estimate variance of sample mean – not random variable

2) a) $\bar{x}_n = 25.92$ $\quad \mu_{\bar{x}} = \mu = 25.92$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = 7/\sqrt{9} = \frac{7}{3}$ $\quad \frac{1-\alpha}{2} = \frac{.95}{2}$ $\quad \frac{1}{2} - \frac{\alpha}{2} = .475 \rightarrow 1 - \frac{\alpha}{2} = .975$

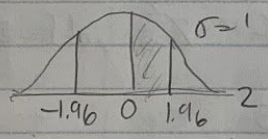
b)



$\bar{x}_u = \bar{x}_n + z_{1-\frac{\alpha}{2}} \left(\sqrt{\frac{\sigma^2}{n}}\right) = 25.92 + (1.96)(2.33)$

$\bar{x}_L = \bar{x}_n - z_{1-\frac{\alpha}{2}} \left(\sqrt{\frac{\sigma^2}{n}}\right) = 25.92 - (1.96)(2.33)$

$[21.35, 30.48]$

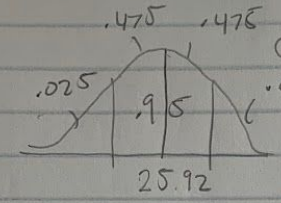


c) margin of error = 4.57, length of CI = 9.14

$4.57\left(\frac{\sqrt{9}}{6.4}\right) = 2.14$ $\quad (1 - .025)$ from t-table $= .975 = 97.5\%$

d) Sample variance = 48.309

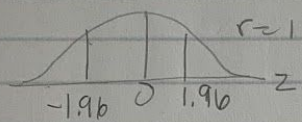
$\sqrt{s^2} = \sqrt{48.309} = 6.95$



$\sigma = \frac{6.95}{3}$

$x_U = \bar{x}_n + z_{1-\frac{\alpha}{2}}\left(\sqrt{\frac{\sigma^2}{n}}\right)$

$x_L = \bar{x}_n - z_{1-\frac{\alpha}{2}}\left(\sqrt{\frac{\sigma^2}{n}}\right)$



$x_U = 25.92 + (1.96)(2.31) = 30.44$

$x_L = 25.92 - (1.96)(2.31) = 21.39$

[21.39, 30.44], the intervals are fairly similiar

3) n=400 compute 90% CI $\alpha = \frac{(1-CL)}{2} = .050$

p=.82 q=.18

$\hat{p} \sim N(p, \sqrt{\frac{pq}{n}}) \rightarrow \hat{p} \sim N(.82, \sqrt{\frac{(.82)(.18)}{400}}) = N(.82, .019)$

$\hat{p} \pm z_{\frac{\alpha}{2}}\sqrt{\frac{pq}{n}} = .82 \pm 1.64\left(\sqrt{\frac{(.82)(.18)}{400}}\right) =$

[.788, .852]