Name: Key

Math 345 Elementary Statistics – Crawford

Quiz 4-A/B

18 April 2018

Use may use a calculator and the given information sheet(s). Books and other notes (in any form) are not allowed. Round final answers to 3 decimal places. *Show your set-up and work.* Good Luck!

`normalcdf(`L, R, μ, σ`)` `invNorm(`A_L, μ, σ`)` `tcdf(`L, R, df`)` `invT(`A_L, df`)`

Chapter 7:

$\hat{p} - E < p < \hat{p} + E$ where $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$

$$\frac{(n-1)s^2}{\chi^2_R} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_L}$$

$\overline{x} - E < \mu < \overline{x} + E$ where $E = t_{\alpha/2}\frac{s}{\sqrt{n}}$

$$\sqrt{\frac{(n-1)s^2}{\chi^2_R}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi^2_L}}$$

Chapter 8: Test Statistics

proportion: $z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$ $\hat{p} = \dfrac{x}{n}$ mean: $t = \dfrac{\overline{x} - \mu}{s/\sqrt{n}}$ standard deviation or variance: $\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$

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1. (7 pts) The mean weight of glass discarded in one week by 8 randomly selected households is 3.84 lbs with a standard deviation of 2.46 lbs. Construct a 95% confidence interval for the standard deviation by

(a). Determining the critical values χ^2_L and χ^2_R. [Clearly indicate which one is χ^2_L and χ^2_R.]

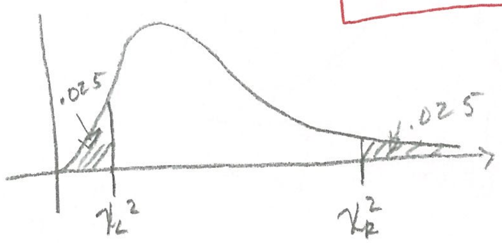
$n = 8 \Rightarrow df = 7$ Table A4

$1 - \alpha = .95$

$\alpha = .05$

$\frac{\alpha}{2} = .025$

$\boxed{\chi_L^2 = 1.690 \quad \chi_R^2 = 16.013}$



Version B 90% CI

$1 - \alpha = .90$

$\alpha = .10$

$\frac{\alpha}{2} = .05$

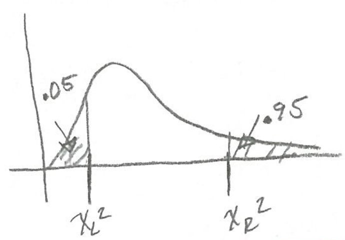


TABLE A4: $\boxed{\chi_L^2 = 2.167 \quad \chi_R^2 = 14.067}$

(b). Then constructing the confidence interval using the appropriate formulas.

$$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$$

$$\sqrt{\frac{(7)(2.46)^2}{16.013}} < \sigma < \sqrt{\frac{7(2.46)^2}{1.690}}$$

$$\boxed{1.626 < \sigma < 5.007}$$

Version B

$$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$$

$$\sqrt{\frac{7(2.46)^2}{14.067}} < \sigma < \sqrt{\frac{7(2.46)^2}{2.167}}$$

$$\boxed{1.735 < \sigma < 4.421}$$

2. (8 pts) A survey showed that among 785 randomly selected subjects who completed four years of college, 18.3% smoke (based on data from the American Medical Association). Use a 0.01 significance level to test the claim that the proportion of those who smoke among people with four years of college is less than the 27% for the general population. [Use the critical value method.]

Version B

Step 4. $\boxed{\alpha = .05}$

1. *Original* claim in symbolic form: $p < .27$
2. Competing idea (complement) in symbolic form: $p \geq .27$
3. H_0 : $p = .27$

   H_1 : $p < .27$ (Left-Tail Test)
4. $\alpha =$ $.01$
5. Formula for the test statistic:

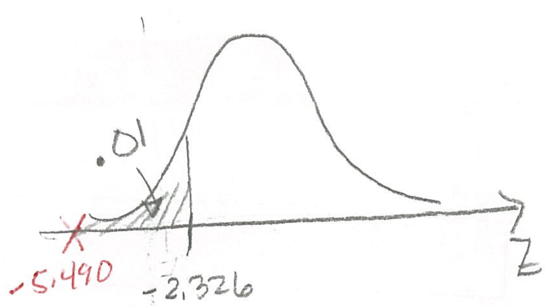
$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$$

$\hat{p} = .183$
$p = .27$
$q = .73$
$n = 785$

6. Observed value of the test statistic with calculations:

$$z = \frac{.183 - .27}{\sqrt{\frac{(.27)(.73)}{785}}} \approx -5.490$$

Graph showing the critical value(s), critical region, and the observed value of the test statistic:



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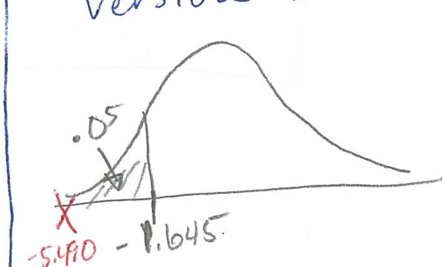

$z_{crit} = \text{invNorm}(.05, 0, 1) \approx -1.645$

Critical value(s): $z_{crit} = \text{invNorm}(.01, \underbrace{0, 1}_{\text{optional}}) \approx -2.326$

7. Circle one: Reject H_0 Fail to reject H_0

8. Wording of the final conclusion in simple, nontechnical terms, addressing the *original* claim.

There is sufficient evidence to support the claim that the proportion of those who smoke among people w/ 4 years of college is less than 27%.