FRIDAY

Statistics 2500 (001) **Quiz #3** **Nov. 16–20, 2009**

SOLUTIONS

Last Name, First Name

15 POINTS

ID

- The point value of each question is indicated. The quiz is marked out of 15.
- No books or notes permitted.
- Normal and T-tables are provided. Please return them with your quiz.

$$\bar{X} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}, \quad \bar{X} \pm t_{\alpha/2}\frac{s}{\sqrt{n}} \quad [(n-1) \text{ df}], \quad n = p(1-p)\left[\frac{z_{\alpha/2}}{E}\right]^2$$

$$z = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}}, \quad t = \frac{\bar{X}-\mu}{s/\sqrt{n}} \quad [(n-1) \text{ df}], \quad z = \frac{\hat{p}-p}{\sqrt{p(1-p)/n}}$$

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(3) 1. A publishing company wishes to construct a 98% confidence interval for the proportion of students that buy the book for their chemistry course. If they want the interval to be accurate within 2.5%, how many students do they need?

$n = p(1-p)\left[\frac{z_{\alpha/2}}{E}\right]^2$.

$p = 0.5$ ① (since unspecified)

$E = 0.025$

98% CI: $\alpha = .02$, $\frac{\alpha}{2} = .01$.

Find $(1-.01) = .99$ in Normal tbl: $z_{.01} = 2.33$ or 2.33 ①

$n = (0.5)(1-0.5)\left[\frac{2.33}{.025}\right]^2 = 2171.56$ 0.5

So $n = 2172$ 0.5

(3) 2. A survey of 63 Walmart customers after Christmas 2008 found they had spent an average of \$184 on the purchase of a Christmas gift for their "significant other", with a standard deviation of \$43.

Find a 90% confidence interval for the average amount spent by all Walmart customers on a Christmas 2008 gift for their "significant other".

$n=63$, $\bar{x}=184$, $s=43$ (okay if $\sigma=43$ used).

$n>30$: Use $\bar{x} \pm z_{\alpha/2}\frac{s}{\sqrt{n}}$

90% CI: $\alpha=.10$, $\frac{\alpha}{2}=.05$, $z_{.05}=1.645$ (1) or 1.64 or 1.65

90% CI: $184 \pm 1.645\left(\frac{43}{\sqrt{63}}\right)$

$= 184 \pm 8.91$

$= (175.09, 192.91)$ (2)

(5) 3. A city property assessor selected a random sample of homes recently sold and recorded their sale values (in 000's). The sale values are below, and they have a variance of 2979.42.

289, 243.5, 198.1, 344.3, 299.9, 221.6

The city believes that the average sale price of homes in the city is no longer \$245,000. Does the data support this claim? State the appropriate hypotheses, test statistic and draw your conclusion at the $\alpha = 0.1$ level.

$H_0: \mu = 245$ (for \$245,000) (1)

$H_1: \mu \neq 245$

NOTE: Take off (0.5) if $\mu = 245000$ used. Also take off no more points than this if $\mu = 245000$ used in test statistic and drawing conclusion.

$\bar{x} = \frac{289 + \cdots + 221.6}{6} =$ 266.07 (0.5)

$s = \sqrt{2979.42} =$ 54.58 (0.5)

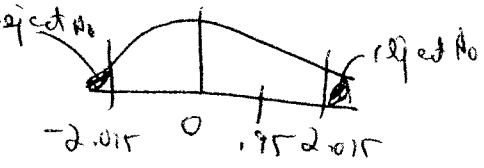
$n < 30$; Test stat: $t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{266.07 - 245}{54.58/\sqrt{6}} =$ 0.95 (1)

$\alpha = 0.10$: Reject H_0 if $t > t_{.10/2}$ or $t < -t_{.10/2}$ using $(n-1) = 5$ d.f.

$t_{.10/2} = t_{.05} =$ 2.015 (1)

Since $0.95 < 2.015$, don't reject H_0 (0.5)

Avg. sale price still \$245000. (0.5)



(4) 4. Dog groomers believe that less than 33% of pet owners have their pets bathed professionally rather than doing it themselves. To assess this claim, they asked 90 pet owners if they would have their pets bathed professionally rather than doing it themselves, and 21 said they would.

Using the p-value, test at the $\alpha = 0.05$ level if you agree with the pet groomers' claim.

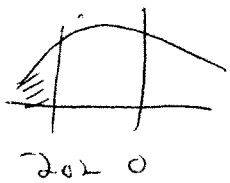
$H_0: p = 0.33$

$H_1: p < 0.33$ (1)

$\hat{p} = \frac{x}{n} = \frac{21}{90} = \boxed{0.23}$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{.23 - .33}{\sqrt{\frac{.33(1-.33)}{90}}} \approx \boxed{-2.02}$$ (1)

P value $= P(z < -2.02)$ (1)



$= \boxed{0.0217}$ (1)

Since $.0217 < \alpha = .05$, reject H_0. (0.5)

Agree with pet groomers. (0.5)