STAT 515 Homework #4 – Mathew Houser

7.110 $\frac{(df)(s)^2}{\chi^2_{\alpha/2}} = \frac{(3)(0.13)^2}{7.81473} = 0.0065$

$\frac{(df)(s)^2}{\chi^2_{1-\alpha/2}} = \frac{(3)(0.13)^2}{0.351846} = 0.1441$

$90\%\ CI = 0.0065 \leq \sigma^2 \leq 0.1441$

We are 90% confident that the true variation in peptide scores is between 0.0065 and 0.1441.

8.10 $H_0: \mu = 5.5$ days $H_a: \mu < 5.5$ days

8.12 $H_0: \mu = 8$ seconds $H_a: \mu \neq 8$ seconds

8.38 (a) $H_0: \mu = 4.7$ $H_a: \mu > 4.7$

(b) $Z_c = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{4.98 - 4.7}{(1.62/\sqrt{258})} = 2.7762$

(c) $Z_c > 1.645$ $(\alpha = 0.05)$

(d) The calculated z-score falls within the rejection region, therefore at the $\alpha = 0.05$ significance level, there is sufficient evidence to conclude that the mean student driver response 5 months after a safe-driver presentation is greater than 4.7.

8.40 (a) $H_0: \mu = 71$ $H_a: \mu > 71$

(b) $Z_c > 1.645$ $(\alpha = 0.05)$

(c) $Z_c = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{73.5 - 71}{6/\sqrt{90}} = 3.9528$

(d) The calculated z-score falls within the reject region, therefore at the $\alpha = 0.05$ significance level, there is sufficient evidence to conclude that the mean resting heart rate during laughter exceeds 71 beats per minute.

8.57 (a) $H_0: \mu = 6$ $H_a: \mu < 6$ $\alpha = 0.05$

Rejection Region: $t_c < -2.132$

$t_c = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{4.8 - 6}{1.3/\sqrt{5}} = -2.0641$

The test statistic falls outside of the rejection region, therefore at the $\alpha = 0.05$ significance level, there is insufficient evidence to conclude that $\mu < 6$.

8.61 $H_0: \mu = 11$ $H_a: \mu \neq 11$ $\alpha = 0.05$

Rejection Region: $|t_c| > 2.145$

$t_c = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{10.7 - 11}{3.6/\sqrt{15}} = -0.32275$

The test statistic falls outside of the rejection region, therefore at the $\alpha = 0.05$ significance level, there is insufficient evidence to conclude that the mean Dental Anxiety Scale score differs from $\mu = 11$.

8.78 (a) $H_0: p = 0.65$ $H_a: p > 0.65$ $\alpha = 0.01$

Rejection Region: $z_c > 2.33$

$z_c = \frac{(\hat{p} - p_0)}{\sqrt{p_0 q_0 / n}} = \frac{0.74 - 0.65}{\sqrt{(0.65)(0.35)/100}} = 1.8869$

The calculated z-score does not fall within the rejection region, therefore at the $\alpha = 0.01$ significance level, there is insufficient evidence to conclude that $p > 0.65$

(b) $H_0: p = 0.65$ $H_a: p > 0.65$ $\alpha = 0.10$

Rejection Region: $z_c > 1.28$

$z_c = 1.8869$ (see part a)

The calculated z-value falls in the rejection region, therefore at the $\alpha = 0.10$ significance level, there is sufficient evidence to conclude that $p > 0.65$.

(c) $n \cdot p_0 = 0.90 \cdot 100 = 90 \geq 15$ ✓ $\quad \therefore$ Test results will be invalid.

$n \cdot q_0 = 0.10 \cdot 100 = 10 \geq 15$ ✗

8.80 (a) $\hat{p} = 506/755 = 0.67$

(b) $H_0: p = 0.7 \quad H_a: p > 0.7$

(c) $$z_c = \frac{\hat{p} - p_0}{\sqrt{p_0 q_0 / n}} = \frac{0.67 - 0.7}{\sqrt{(0.7)(0.3)/755}} = -1.799$$

(d) $z_c > 2.33 \quad (\alpha = 0.01)$

(e) $P(z > -1.799) = 0.964$

(f) The calculated z-value does not fall in the reject region, therefore at the $\alpha = 0.01$ significance level, there is insufficient evidence to conclude that $p > 0.7$.

(g) The calculated p-value is > 0.01, therefore at the $\alpha = 0.01$ significance level, there is insufficient evidence to conclude that $p > 0.7$.