

Section 8-4

$$\begin{array}{llll} 8-38 & \chi_{0.05,10}^2 = 18.31 & \chi_{0.025,15}^2 = 27.49 & \chi_{0.01,12}^2 = 26.22 \\ & \chi_{0.005,25}^2 = 46.93 & \chi_{0.95,20}^2 = 10.85 & \chi_{0.99,18}^2 = 7.01 & \chi_{0.995,16}^2 = 5.14 \end{array}$$

8-42 95% confidence interval for σ
 $n = 17$ $s = 0.09$

$$\chi_{\alpha/2, n-1}^2 = \chi_{0.025, 16}^2 = 28.85 \text{ and } \chi_{1-\alpha/2, n-1}^2 = \chi_{0.975, 16}^2 = 6.91$$

$$\frac{16(0.09)^2}{28.85} \leq \sigma^2 \leq \frac{16(0.09)^2}{6.91}$$

$$0.0045 \leq \sigma^2 \leq 0.0188$$

$$0.067 < \sigma < 0.137$$

8-46 a) 99% two-sided confidence interval on σ^2

$$n = 10 \quad s = 1.913 \quad \chi_{0.005, 9}^2 = 23.59 \text{ and } \chi_{0.995, 9}^2 = 1.73$$

$$\frac{9(1.913)^2}{23.59} \leq \sigma^2 \leq \frac{9(1.913)^2}{1.73}$$

$$1.396 \leq \sigma^2 \leq 19.038$$

b) 99% lower confidence bound for σ^2

$$\text{For } \alpha = 0.01 \text{ and } n = 10, \chi_{\alpha, n-1}^2 = \chi_{0.01, 9}^2 = 21.67$$

$$\frac{9(1.913)^2}{21.67} \leq \sigma^2$$

$$1.5199 \leq \sigma^2$$

c) 90% lower confidence bound for σ^2

$$\text{For } \alpha = 0.1 \text{ and } n = 10, \chi_{\alpha, n-1}^2 = \chi_{0.1, 9}^2 = 14.68$$

$$\frac{9(1.913)^2}{14.68} \leq \sigma^2$$

$$2.2436 \leq \sigma^2$$

$$1.498 \leq \sigma$$

d) The lower confidence bound of the 99% two-sided interval is less than the one-sided interval. The lower confidence bound for σ^2 in part (c) is greater because the confidence is lower.

8-48 a) 95% Confidence Interval on the proportion of such tears that will heal.

$$\hat{p} = 0.676 \quad n = 37 \quad z_{\alpha/2} = 1.96$$

$$\hat{p} - z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \leq p \leq \hat{p} + z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$0.676 - 1.96 \sqrt{\frac{0.676(0.324)}{37}} \leq p \leq 0.676 + 1.96 \sqrt{\frac{0.676(0.324)}{37}}$$

$$0.5245 \leq p \leq 0.827$$

b) 95% lower confidence bound on the proportion of such tears that will heal.

$$\hat{p} - z_{\alpha} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \leq p$$

$$0.676 - 1.64 \sqrt{\frac{0.676(0.33)}{37}} \leq p$$

$$0.549 \leq p$$

8-52 a) 95% Confidence Interval on the true proportion of helmets showing damage

$$\hat{p} = \frac{18}{50} = 0.36 \quad n = 50 \quad z_{\alpha/2} = 1.96$$

$$\hat{p} - z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \leq p \leq \hat{p} + z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$0.36 - 1.96 \sqrt{\frac{0.36(0.64)}{50}} \leq p \leq 0.36 + 1.96 \sqrt{\frac{0.36(0.64)}{50}}$$

$$0.227 \leq p \leq 0.493$$

$$\text{b) } n = \left(\frac{z_{\alpha/2}}{E} \right)^2 p(1-p) = \left(\frac{1.96}{0.02} \right)^2 0.36(1-0.36) = 2212.76$$

$$n \cong 2213$$

$$\text{c) } n = \left(\frac{z_{\alpha/2}}{E} \right)^2 p(1-p) = \left(\frac{1.96}{0.02} \right)^2 0.5(1-0.5) = 2401.$$