15. Test statistic: $\chi^2 = 2.925$. Critical value: $\chi^2 = 5.991$. P-value > 0.10 (Tech: 0.232). There is not sufficient evidence to warrant rejection of the claim that getting a cold is independent of the treatment group. The results suggest that echinacea is not effective for preventing colds.
17. Test statistic: $\chi^2 = 20.271$. Critical value: $\chi^2 = 15.086$. P-value < 0.005 (Tech: 0.0011). There is sufficient evidence to warrant rejection of the claim that cooperation of the subject is independent of the age category. The age group of 60 and over appears to be particularly uncooperative.
19. Test statistic: $\chi^2 = 0.773$. Critical value: $\chi^2 = 11.345$. P-value > 0.10 (Tech: 0.856). There is not sufficient evidence to warrant rejection of the claim that getting an infection is independent of the treatment. The atorvastatin treatment does not appear to have an effect on infections.
21. Test statistics: $\chi^2 = 12.1619258$ and $z = 3.487395274$, so that $z^2 = \chi^2$. Critical values: $\chi^2 = 3.841$ and $z = \pm 1.96$, so $z^2 = \chi^2$ (approximately).

Chapter 11: Quick Quiz

1. H_0: $p_1 = p_2 = p_3 = p_4 = p_5$. H_1: At least one of the probabilities is different from the others.
2. $O = 23$ and $E = 21.4$.
3. Right-tailed.
4. $df = 4$ and the critical value is $\chi^2 = 9.488$.
5. There is not sufficient evidence to warrant rejection of the claim that occupation injuries occur with equal frequency on the different days of the week.
6. H_0: Response to the question is independent of gender. H_1: Response to the question and gender are dependent.
7. Chi-square distribution.
8. Right-tailed.
9. $df = 2$ and the critical value is $\chi^2 = 5.991$.
10. There is not sufficient evidence to warrant rejection of the claim that response is independent of gender.

Chapter 11: Review Exercises

1. Test statistic: $\chi^2 = 931.347$. Critical value: $\chi^2 = 16.812$. P-value: 0.000. There is sufficient evidence to warrant rejection of the claim that auto fatalities occur on the different days of the week with the same frequency. Because people generally have more free time on weekends and more drinking occurs on weekends, the days of Friday, Saturday, and Sunday appear to have disproportionately more fatalities.
2. Test statistic: $\chi^2 = 6.500$. Critical value: $\chi^2 = 16.919$. P-value > 0.10 (Tech: 0.689). There is not sufficient evidence to warrant rejection of the claim that the last digits of 0, 1, 2, . . . , 9 occur with the same frequency. It does appear that the weights were obtained through measurements.
3. Test statistic: $\chi^2 = 288.448$. Critical value: $\chi^2 = 24.725$. P-value < 0.005 (Tech: 0.000). There is sufficient evidence to warrant rejection of the claim that weather-related deaths occur in the different months with the same frequency. The summer months appear to have disproportionately more weather-related deaths, and that is probably due to the fact that vacations and outdoor activities are much greater during those months.
4. Test statistic: $\chi^2 = 10.708$. Critical value: $\chi^2 = 3.841$. P-value: 0.00107. There is sufficient evidence to warrant rejection of the claim that wearing a helmet has no effect on whether facial injuries are received. It does appear that a helmet is helpful in preventing facial injuries in a crash.
5. Test statistic: $\chi^2 = 4.955$. Critical value: $\chi^2 = 3.841$. P-value < 0.05 (Tech: 0.0260). There is sufficient evidence to warrant rejection of the claim that when flipping or spinning a penny, the outcome is independent of whether the penny was flipped or spun. It appears that the outcome is affected by whether the penny is flipped or spun. If the significance level is changed to 0.01, the critical value changes to 6.635, and we fail to reject the given claim, so the conclusion does change.
6. Test statistic: $\chi^2 = 4.737$. Critical value: $\chi^2 = 7.815$. P-value > 0.10 (Tech: 0.192). There is not sufficient evidence to warrant rejection of the claim that home/visitor wins are independent of the sport.

Chapter 11: Cumulative Review Exercises

1. H_0: $p = 0.5$. H_1: $p \neq 0.5$. Test statistic: $z = 7.28$. Critical values: $z = \pm 1.96$. P-value: 0.0002 (Tech: 0.0000). Reject H_0. There is sufficient evidence to warrant rejection of the claim that among those who die in weather-related deaths, the percentage of males is equal to 50%.
2. $59.0\% < p < 65.0\%$. Because the confidence interval does not include 50% (or "half"), we should reject the stated claim.
3. $\bar{x} = 53.7$ years, median $= 60.0$ years, $s = 16.1$ years. Because an age of 16 differs from the mean by more than 2 standard deviations, it is an unusual age.
4. 42.2 years $< \mu <$ 65.2 years. Yes, the confidence interval limits do contain the value of 65.0 years that was found from a sample of 9269 ICU patients.
5. a. $r = -0.0458$. Critical values: $r = \pm 0.632$. P-value $= 0.900$. There is not sufficient evidence to support the claim that there is a linear correlation between the numbers of boats and the numbers of manatee deaths.
   b. $\hat{y} = 96.1 - 0.137x$
   c. 83.2 manatee deaths (the value of $\bar{y}$). The predicted value is not very accurate because it is not very close to the actual value of 78 manatee deaths.
6. a. 630 mm
   b. 14.46% (Tech: 14.48%). That percentage is too high, because too many women would not be accommodated.
   c. 0.7611 (Tech: 0.7599). Groups of 16 women do not occupy a cockpit; because individual women occupy the cockpit, this result has no effect on the design.
7. a. Statistic.
   b. Quantitative.
   c. Discrete.
   d. The sampling is conducted so that all samples of the same size have the same chance of being selected.
   e. The sample is a voluntary response sample (or self-selected sample), and those with strong feelings about the topic are more likely to respond, so it is not a valid sampling plan.
8. a. 0.130 b. 0.4