9. There is not sufficient evidence to support a claim that the length estimates are affected by the sex of the subject.
10. There is not sufficient evidence to support a claim that the length estimates are affected by the subject's major.

Chapter 12: Review Exercises

1. H_0: $\mu_1 = \mu_2 = \mu_3$. Test statistic: $F = 10.10$. P-value: 0.001. Reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that 4-cylinder cars, 6-cylinder cars, and 8-cylinder cars have the same mean highway fuel consumption amount.
2. For interaction, the test statistic is $F = 0.17$ and the P-value is 0.915, so there is not sufficient evidence to conclude that there is an interaction effect. For the row variable of site, the test statistic is $F = 0.81$ and the P-value is 0.374, so there is not sufficient evidence to conclude that the site has an effect on weight. For the column variable of treatment, the test statistic is $F = 7.50$ and the P-value is 0.001, so there is sufficient evidence to conclude that the treatment has an effect on weight.
3. Test statistic: $F = 42.9436$. P-value: 0.000. Reject H_0: $\mu_1 = \mu_2 = \mu_3$. There is sufficient evidence to warrant rejection of the claim that the three different types of cigarettes have the same mean amount of tar. Given that the king-size cigarettes have the largest mean of 21.1 mg per cigarette, compared to the other means of 12.9 mg per cigarette and 13.2 mg per cigarette, it appears that the filters do make a difference (although this conclusion is not justified by the results from analysis of variance).
4. For interaction, the test statistic is $F = 0.8733$ and the P-value is 0.3685, so there does not appear to be an effect from an interaction between gender and whether the subject smokes. For gender, the test statistic is $F = 0.0178$ and the P-value is 0.8960, so gender does not appear to have an effect on body temperature. For smoking, the test statistic is $F = 3.0119$ and the P-value is 0.1082, so there does not appear to be an effect from smoking on body temperature.

Chapter 12: Cumulative Review Exercises

1. a. 15.5 years, 13.1 years, 22.7 years
   b. 9.7 years, 9.0 years, 18.6 years
   c. 94.5 years^2, 80.3 years^2, 346.1 years^2
   d. Ratio.
2. Test statistic: $t = -1.383$. Critical values: $t = \pm 2.160$ (assuming a 0.05 significance level). (Tech: P-value = 0.1860.) Fail to reject H_0: $\mu_1 = \mu_2$. There is not sufficient evidence to support the claim that there is a difference between the means for the two groups.
3. Normal, because the histogram is approximately bell-shaped (or the points in a normal quantile plot are reasonably close to a straight-line pattern with no other pattern that is not a straight-line pattern).
4. 12.3 years $< \mu <$ 18.7 years
5. a. H_0: $\mu_1 = \mu_2 = \mu_3$
   b. Because the P-value of 0.051 is greater than the significance level of 0.05, fail to reject the null hypothesis of equal means. There is not sufficient evidence to warrant rejection of the claim that the three means are equal. The three populations do not appear to have means that are significantly different.
6. a. $r = 0.918$. Critical values: $r = \pm 0.707$. P-value = 0.001. There is sufficient evidence to support the claim that there is a linear correlation between September weights and the subsequent April weights.
   b. $\hat{y} = 9.28 + 0.823x$
   c. 86.6 kg, which is not very close to the actual April weight of 105 kg.
7. a. 0.1587
   b. 0.6825 (Tech: 0.6827)
   c. 0.9987
   d. 334.6 (Tech: 334.7)
8. a. 200
   b. $0.175 < p < 0.225$
   c. Yes. The confidence interval shows us that we have 95% confidence that the true population proportion is contained within the limits of 0.175 and 0.225, and 1/4 is not included within that range.
9. a. The distribution should be uniform, with a flat shape. The given histogram agrees (approximately) with the uniform distribution that we expect.
   b. No. A normal distribution is approximately bell-shaped, but the given histogram is far from being bell-shaped.
10. Test statistic: $\chi^2 = 10.400$. Critical value: $\chi^2 = 16.919$ (assuming a 0.05 significance level). P-value > 0.10 (Tech: 0.319). There is not sufficient evidence to warrant rejection of the claim that the digits are selected from a population in which the digits are all equally likely. There does not appear to be a problem with the lottery.

Chapter 13

Section 13-2

1. The only requirement for the matched pairs is that they constitute a simple random sample. There is no requirement of a normal distribution or any other specific distribution. The sign test is "distribution free" in the sense that it does not require a normal distribution or any other specific distribution.
3. H_0: There is no difference between the populations of September weights and April weights. H_1: There is a difference between the populations of September weights and April weights. The sample data do not contradict H_1 because the numbers of positive signs (2) and negative signs (7) are not exactly the same.
5. The test statistic of $x = 1$ is less than or equal to the critical value of 2 (from Table A-7). There is sufficient evidence to warrant rejection of the claim of no difference. There does appear to be a difference.
7. The test statistic of $z = -22.18$ falls in the critical region bounded by $z = -1.96$ and 1.96. There is sufficient evidence to warrant rejection of the claim of no difference. There does appear to be a difference.
9. The test statistic of $x = 1$ is less than or equal to the critical value of 1 (from Table A-7). There is sufficient evidence to warrant rejection of the claim of no difference. There does appear to be a difference.