Text Exercise Set 28

NAME:

28-1 A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean length of fish among three lakes: North Lake, Blue Lake, and Harvey Lake. The data consisting of independent random samples is displayed in the table on the right.

(a) Explain how the data for this hypothesis test is appropriate for a one-way ANOVA.

(b) Complete the four steps of the hypothesis test below. As part of the second step, complete the construction of the ANOVA table below, where you should find that $SSB = 40$, $SSE = 48$, and Fisher’s $f$ statistic is $f_{2,12} = 5.00$.

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<tr>
<th>Step 1</th>
<th>$H_0$:</th>
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| Step 2 |

| Step 3 |

| Step 4 |

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(c) If multiple comparison is necessary, apply Scheffe's method and state the results; if multiple comparison is not necessary, explain why not.

(d) In the list below, circle the best graphical display for this data and say why.

(i) multiple pie charts    (ii) scatter plot    (iii) multiple box plots

(e) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(f) Decide whether $H_0$ would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

(g) What would the presence of one or more outliers in the data suggest about using the $f$ statistic?
A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean lifetime among three brands of light bulbs: Brite, Softlite, and Nodark. The data consisting of independent random samples is displayed in the table on the right.

(a) Explain how the data for this hypothesis test is appropriate for a one-way ANOVA.

(b) Complete the four steps of the hypothesis test below. As part of the second step, complete the construction of the ANOVA table below, where you should find that $SS_B = 4644$, $SS_E = 4682$, and Fisher’s $f$ statistic is $f_{2, 9} = 4.46$.

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- $H_1$: 
- $\alpha =$

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Light Bulb Lifetimes (hours) for Three Different Brands

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<tbody>
<tr>
<td>Brite</td>
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<td>1121</td>
<td>1151</td>
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<tr>
<td>Softlite</td>
<td>1066</td>
<td>1097</td>
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<td>1112</td>
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<td>1139</td>
<td>1147</td>
<td>1112</td>
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28-2 - continued

(c) If multiple comparison is necessary, apply Scheffe's method and state the results; if multiple comparison is not necessary, explain why not.

(d) In the list below, circle the best graphical display for this data and say why.

(i) multiple pie charts    (ii) scatter plot    (iii) multiple box plots

(e) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(f) Decide whether $H_0$ would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

(g) What would the presence of one or more outliers in the data suggest about using the $f$ statistic?
A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean weight of water necessary to penetrate a paper towel among four brands of paper towels: Tuff, Econ, Cheep, and Super. The data consisting of independent random samples is displayed in the table on the right.

(a) Explain how the data for this hypothesis test is appropriate for a one-way ANOVA.

(b) Complete the four steps of the hypothesis test below. As part of the second step, complete the construction of the ANOVA table below, where you should find that $SSB = 180$, $SSE = 268$, and Fisher’s $f$ statistic is $f_{3,20} = 4.48$.

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- $H_1$: 
- $\alpha =$

Step 2

Step 3

Step 4

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28.3 - continued

(c) If multiple comparison is necessary, apply Scheffe's method and state the results; if multiple comparison is not necessary, explain why not.

(d) In the list below, circle the best graphical display for this data and say why.

(i) multiple pie charts  (ii) scatter plot  (iii) multiple box plots

(e) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(f) Decide whether $H_0$ would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

(g) What would the presence of one or more outliers in the data suggest about using the $f$ statistic?
A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean height of a particular type of plant when raised under natural light, white light, and red light. The data consisting of independent random samples is displayed in the table on the right.

(a) Explain how the data for this hypothesis test is appropriate for a one-way ANOVA.

(b) Complete the four steps of the hypothesis test below. As part of the second step, complete the construction of the ANOVA table below, where you should find that $SSB = 4022$, $SSE = 2740$, and Fisher’s $f$ statistic is $f_{2, 23} = 16.88$.

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(c) If multiple comparison is necessary, apply Scheffe's method and state the results; if multiple comparison is not necessary, explain why not.

(d) In the list below, circle the best graphical display for this data and say why.

(i) multiple pie charts       (ii) scatter plot       (iii) multiple box plots

(e) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(f) Decide whether $H_0$ would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

(g) What would the presence of one or more outliers in the data suggest about using the $f$ statistic?
28-5 A cafeteria offers a choice of five flavors of ice cream: chocolate, vanilla, strawberry, peach, and banana. The manager of the cafeteria believes that these flavors are equally preferred by customers. In order to perform a hypothesis test to decide if there is any evidence against the manager's belief, 200 customers are going to be randomly selected and asked which of the five flavors they favor.

(a) Explain how the data for this hypothesis test is not appropriate for a one-way ANOVA.

(b) If the manager's belief is true, about how many customers would you expect to prefer each of the five flavors among the 200 to be surveyed?

28-6 The Sweetuth candy company produces gumballs in four different colors: red, orange, green, and blue. The company claims that an equal proportion of each candy color is produced. In order to perform a hypothesis test to decide if there is any evidence against the company's claim, 690 pieces of candy are going to be randomly selected and separated by color.

(a) Explain how the data for this hypothesis test is not appropriate for a one-way ANOVA.

(b) If the company's claim is true, about how many of each color would you expect to observe among the 690 to be selected?
28-7 Based on surveys done several years ago concerning consumer preferences for various brands of toothpaste, a salesman believes that 35% of all consumers prefer White, 30% prefer Nocav, 25% prefer Cheepo, and 10% prefer other brands. In order to perform a hypothesis test to decide if there is any evidence against the salesman's belief, 830 consumers are going to be randomly selected and asked which toothpaste they prefer.

(a) Explain how the data for this hypothesis test is not appropriate for a one-way ANOVA.

(b) If the salesman's belief is true, about how many consumers would you expect to be in each of the four categories among the 830 consumers to be selected?

28-8 For a long time, it was claimed that the composition of voters in a particular city was 35% Democrat, 45% Republican, and 20% Others. In order to perform a hypothesis test to decide if there is any evidence against the claim, 250 voters are to be randomly selected and classified into one of the three political party categories.

(a) Explain how the data for this hypothesis test is not appropriate for a one-way ANOVA.

(b) If the claim is true, about how many voters would you expect to observe in each of the three political party categories among the 250 voters to be selected?