

**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.

<b>Length of Fish (inches) for Three Different Lakes</b>					
North Lake:	13	17	15	18	17
Blue Lake:	15	12	16	11	16
Harvey Lake:	14	10	12	13	11

- (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  $f_{2,12} = 5.00$ .

Step 1  $H_0$ :  
 $H_1$ :  
 $\alpha =$

Step 2

Step 3

Step 4

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>f</i>	<i>P-value</i>
Error					
Total					

**28-1** - *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?

**28-2** 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.

<b>Light Bulb Lifetimes (hours) for Three Different Brands</b>					
Brite:	1094	1121	1151		
Softlite:	1066	1097	1117	1112	1078
Nodark:	1158	1139	1147	1112	

- (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  $SSB = 4644$ ,  $SSE = 4682$ , and Fisher's  $f$  statistic is  $f_{2,9} = 4.46$ .

Step 1  $H_0$ :  
 $H_1$ :  
 $\alpha =$

Step 2

Step 3

Step 4

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>f</i>	<i>P-value</i>
Error					
Total					

**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?

**28-3** 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.

Penetration Weight (grams) for Four Paper Towel Brands						
Tuff:	112	104	110	108	112	114
Econ:	120	116	122	114	112	118
Cheep:	106	114	110	108	116	112
Super:	120	110	112	112	114	116

- (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  $f_{3,20} = 4.48$ .

Step 1  $H_0$ :  
 $H_1$ :  
 $\alpha =$

Step 2

Step 3

Step 4

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>f</i>	<i>P-value</i>
Error					
Total					

**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?

**28-4** 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.

<b>Plant Heights (centimeters) with Three Types of Light</b>									
Natural:	71	96	94	87	97	79	92	90	68
White:	83	55	67	58	71	63	79		
Red:	67	45	52	70	44	62	42	55	59

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  $f_{2,23} = 16.88$ .

Step 1  $H_0$ :  
 $H_1$ :  
 $\alpha =$

Step 2

Step 3

Step 4

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>f</i>	<i>P-value</i>
Error					
Total					

**28-4 - 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?



**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 Whito, 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?