Chapter 12: Analysis of Variance

Itiple Choice

This activity contains 10 questions.

1. [Hint]

A consumer group is testing the gas mileage of three different models of cars. The following information summarizes the sample data.

Model 1	Model 2	Model 3
$\bar{x}_1 = 24.0$	$\bar{x}_2 = 20.0$	$\bar{x}_3 = 19.0$
$s_1^2 = 0.71$	$s_2^2 = 0.55$	$s_3^2 = 0.77$
$n_1 = 6$	$n_2 = 6$	$n_3 = 6$

The sample variance for all the data equals 5.54. What is the total sum of squares?

- *94.2*
- *10.2*
- *18*
- *84.0*

2. [Hint]

A consumer group is testing the gas mileage of three different models of cars. The following information summarizes the sample data.

Model 1	Model 2	Model 3
$\bar{x}_1 = 24.0$	$\bar{x}_2 = 20.0$	$\bar{x}_3 = 19.0$
$s_1^2 = 0.71$	$s_2^2 = 0.55$	$s_3^2 = 0.77$
$n_1 = 6$	$n_2 = 6$	$n_3 = 6$

The sample variance for all the data equals 5.54. What is the sum of squares between?

- *18*
- *94.2*
- *10.2*
- *84.0*

3. [Hint]

A consumer group is testing the gas mileage of three different models of cars. The following information summarizes the sample data.

Model 1	Model 2	Model 3
$\bar{x}_1 = 24.0$	$\bar{x}_2 = 20.0$	$\bar{x}_3 = 19.0$
$s_1^2 = 0.71$	$s_2^2 = 0.55$	$s_3^2 = 0.77$
$n_1 = 6$	$n_2 = 6$	$n_3 = 6$

The sample variance for all the data equals 5.54. Using alpha equal to 0.05, which of the following statements are correct with regards to the average gas mileage of the 3 car models?

- *Since the F-test statistic equals 61.8 and the critical value equals 3.682, we fail to reject the null hypothesis and conclude that there is no evidence that the gas mileage of the three car models are not equal.*
- *Since the F-test statistic equals 61.8 and the critical value equals 3.682, we reject the null hypothesis and conclude that the gas mileage of the three car models are not equal.*
- *Since the F-test statistic equals 3.682 and the critical value equals 61.8, we fail to reject the null hypothesis and conclude that there is no evidence that the gas mileage of the three car models are not equal.*
- *Since the F-test statistic equals 3.682 and the critical value equals 61.8, we reject the null hypothesis and conclude that the gas mileage of the three car models are not equal.*

4. [Hint]

A medical researcher wants to determine whether there is a difference in the mean time to relief for four seasonal allergy medications. The results are shown below:

Med. 1	Med. 2	Med. 3	Med. 4
12	16	14	17
14	14	24	14
11	21	15	13
17	25	18	16

Below is the partially completed ANOVA table.

Source of Variation	*SS*	*df*	*MS*	*F-Ratio*
Between Samples	75.6875			
Within Samples	165.75	12	13.8125	
Total	241.4375	15		

The F-Ratio for this ANOVA is _____ .

- *1.8265*
- *2.3724*
- *3.4902*
- *2.1899*

5. [Hint]

For Question 4, a p-value of .196 was calculated. At α=.05 we should

- *not reject the null hypothesis and conclude that there is a difference in the mean time to relief.*
- *reject the null hypothesis and conclude that there is a difference in the mean time to relief.*
- *not reject the null hypothesis and conclude that there is no difference in the mean time to relief.*
- *reject the null hypothesis and conclude that there is no difference in the mean time to relief.*

6. [Hint]

When testing the performance of three different golf drivers using ANOVA, we concluded to reject the null hypothesis and therefore that the mean distance the ball traveled was different among the three clubs. The researcher is now interested in knowing which of the clubs are different. Output for the Tukey-Kramer Procedure for Multiple Comparisons is given below.

	$\lvert\bar{x}_i - \bar{x}_j\rvert$	Critical Range
Club 1 vs. Club 2	1.2	14.996
Club 1 vs. Club 3	14.3	14.996
Club 2 vs. Club 3	15.5	14.996

From this table we can conclude

- *The mean distance traveled by balls using Club 2 is significantly higher than the mean distance traveled by balls using Club 3.*
- *The mean distance traveled by balls using Club 1 is significantly different from the mean distance traveled by balls using Club 2 and Club 3.*
- *The mean distance traveled by balls using Club 1 is significantly higher than the mean distance traveled by balls using Club 2.*
- *The mean distance traveled by balls using Club 3 is significantly higher than the mean distance traveled by balls using Club 1 and Club 2.*

7. [Hint]

A randomized block ANOVA was performed and the following partial completed ANOVA table is available.

Source of Variation	SS	df	MS	F-Ratio
Between Blocks	283.3	5		
Between Samples		3		
Within Samples	224.7			
Total	2295.6	23		

How many observations are there?

- *15*
- *6*
- *24*
- *4*

8. [Hint] ***Referring to Question #7, what is the value of MSB?***

Source of Variation	SS	df	MS	F-Ratio
Between Blocks	283.3	5		
Between Samples		3		
Within Samples	224.7			
Total	2295.6	23		

- *56.67*
- *14.98*
- *39.78*
- *595.87*

9. [Hint] ***When calculating an ANOVA table for Two-Factor Analysis of Variance with Replication, we consider the following sources of variation except:***

- *Factor A.*
- *Factor B.*
- *Interaction affects.*
- *Between Blocks.*