

## Assignment #4, Due 8/5(or 8/6)/2024

1. The following data are from a completely randomized design.

	Treatment A	Treatment B	Treatment C
	32	44	33
	30	43	36
	30	44	35
	26	46	36
	32	48	40
Sample Mean	30	45	36
Sample Varianc	6.00	4.00	6.50

- (a) At the  $\alpha = .05$  level of significance, can we reject the null hypothesis that the means of the three treatments are equal?
- (b) Use Fisher's LSD procedure to test whether there is a significant difference between the means for treatments A and B, treatments A and C, and treatments B and C. Use  $\alpha = .05$ .
- (c) Use Fisher's LSD procedure to develop a 95% confidence interval estimate of the difference between the means of treatments A and B.
2. Auditors must make judgments about various aspects of an audit on the basis of their own direct experience, indirect experience, or a combination of two. In a study, auditors were asked to make judgments about the frequency of errors to be found in an audit. The judgments by the auditors were then compares to the actual results. Suppose the following data were obtained from a similar study; lower scores indicate better judgments.

Direct	Indirect	Combination
17.0	16.6	25.2
18.5	22.2	24.0
15.8	20.5	21.5
18.2	18.3	26.8
20.2	24.2	27.5
16.0	19.8	25.8
13.3	21.2	24.2

Use  $\alpha=.01$  to test to see whether the basis for the judgment affects the quality of the judgment. State your conclusion and find out if which experience has a better judgment. (Hint: You are given the following ANOVA table.)

Source Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Treatments				
Error	91.66	18		
Total	317.34			

3. A computer manufacturer has developed a regression model relating Sales (Y in \$10,000) with four independent variables. The four independent variables are Price (in dollars), Competitor's Price (in dollars), Advertising (in \$1000) and Type of computer produced (Type = 0 if desktop, Type = 1 if laptop). Part of the regression results are shown below.

ANOVA			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	4	27641631.121	6910407.780
Residual	35	42277876.624	1207939.332

  

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	2268.233	1237.880	
Price	-0.803	0.316	
Competitor's Price	0.859	0.281	
Advertising	0.216	0.079	
Type	567.806	373.400	

- (a) What has been the sample size?  
 (b) Determine the coefficient of determination.  
 (c) Compute the test statistic t for each of the four independent variables.  
 (d) Determine the p-values for the four variables.
4. Consider the following time series data.

Quarter	Year 1	Year 2	Year 3
1	71	68	62
2	49	41	51
3	58	60	53
4	78	81	72

- (a) Construct a time series plot. What type of pattern exists in the data?  
 (b) Use the following dummy variables to develop an estimated regression equation to account for seasonal effects in the data: Qtr1 = 1 if Quarter 1, 0 otherwise; Qtr2 = 1 if Quarter 2, 0 otherwise; Qtr3 = 1 if Quarter 3, 0 otherwise.  
 (c) Compute the quarterly forecasts for next year.

5. Below you are given information on crime statistics for Middletown.

Year	Quarter	Number of Crimes Committed $Y_t$
1	1	10
	2	20
	3	25
	4	5
2	1	10
	2	30
	3	35
	4	25
3	1	20
	2	40
	3	35
	4	15
4	1	20
	2	50
	3	45
	4	35

The seasonal factors for these data are

Quarter	Seasonal Factor $S_t$
1	.589
2	1.351
3	1.335
4	.726

- Deseasonalize the series.
- Obtain an estimate of the linear trend for this series.
- Use the seasonal and trend components to forecast the number of crimes for each quarter of Year 5.