

ERSH 8310

Homework #4

Due: 10/11/2007 at 11:59:59pm

1. A manufacturer frequently sends small packages to a customer in another city via air freight, and in many cases it is important for a package to reach the customer as soon as possible. Two different firms offer air freight service, including pickup and delivery, on a 24-hour basis. The head of the manufacturer's shipping department would like to know if the firms differ in speed of service and if time of day makes any difference. An experiment is designed to investigate these issues. Packages are sent at random times (either morning or afternoon), and the air freight firm used (either Speedy Air Freight or ABC Shipping) is also randomly chosen. The customer records the time that each package arrives so that the time elapsed during shipping can be determined. The times are rounded to the nearest hour. The experimental results for a total of 12 packages are shown in the following table.

Time/Firm	Speedy Air Freight	ABC Shipping
Morning	8, 6, 7	11, 9, 8
Afternoon	7, 8, 9	10, 10, 11

Run a two-way ANOVA analysis on these data and answer the following questions.

- a. Is there an interaction effect between company and time of day?
- b. Is there a main effect of company?
- c. Is there a main effect of time of day?

For each report the null hypothesis, the alternative hypothesis, the test statistic, the p-value, and the statistical decision regarding the null hypothesis (test each using a Type-I error rate of 0.05). Also, for each, provide a plot of the means that corresponds to the type of test being conducted.

2. Complete the following ANOVA table (fill in the blanks):

Source	SS	df	MS	F	p-value
SS _A	20	1			
SS _B		3	45		
SS _{AxB}	90				
SS _{S/A}	220				
Total		29			

Hint: use the '=fdist()' command in Excel for the p-value.