

Name _____

Lab Section _____

TA's Name _____

ST204: Lab Assignment 6 – Last Assignment!

Due: Friday, May 3 in your lab section

The goal of this assignment is to give you experience using Minitab to carry out chi-square and quality control analyses.

DIRECTIONS: Write your answers on this form and attach your Minitab printout (copy the relevant parts into another document). Each part of questions 1 and 2 is worth 4 points (40 points total). Problem 3 is worth 5 extra credit points (so you can score up to 45 out of 40 points on the lab).

1. A consulting firm was asked to determine whether the preference for one of three weekly news magazines is related to the consumer's location within the United States. A random sample was obtained for each of four geographic regions. Each person in the sample was asked to state their first choice among the three magazines. The data are shown in the table below.

Region	Magazine		
	Time	Newsweek	U.S. News
North	150	60	40
South	100	100	50
East	150	50	50
West	125	50	75

- a. Use Minitab to obtain a Chi Square test of independence to determine whether magazine choice and region are related. In Minitab, enter the values given above into columns C1-C3. You can name C1 "Time", C2 "Newsweek", and C3 "U.S. News". Select Stat, Tables, Chi-Square Test. In the "Columns containing the table" box, enter C1-C3, then select OK to run the analysis. Copy and paste the results from the session window to your document.
- b. In the space below, verify using hand calculations that the expected frequency listed for the second row, first column (choice is Time magazine in the South) is correct.
- c. Next to $\chi^2 =$, the first value listed is the cell discrepancy for the first row, first column (Time magazine in the North). In the space below, verify using hand calculations that the first value given is correct.
- d. In the space below, verify the value for the degrees of freedom.
- e. Make the decision based on the p-value. Use a .01 significance level. What is the decision (reject or fail to reject the null hypothesis), and why?
- f. Explain what the decision in part (e) indicates regarding the relationship or lack of relationship between magazine choice and region.

- g. Based on the cell discrepancies, the second row, second column showed the greatest discrepancy between the frequency that was observed and the frequency that would be expected if the null hypothesis were true. Compare the observed and expected frequencies, and comment on how they are different in terms of the problem.
2. A company that manufactures circuit boards uses a liquid chemical to wash the boards. The chemical must be monitored periodically to ensure that the amount of acid contained in the mixture is within a specified range. Once each day an operator collects four beaker of liquid from random locations in a tank containing the chemical. The acid concentration of liquid in each beaker is measured in micrograms per liter. The file acid.MTW contains the data for this production process for samples from 30 days. The file acid.MTW is available from the ST204 webpage or the g: drive in Weber 205/206. Be sure to use this file and not the acid files that come with Minitab.
- a. Use Minitab to obtain control charts to investigate whether or not the process is in control. In Minitab, select File→Open Worksheet to open acid.MTW. To make the charts, select Stat→Control Charts→Xbar-R. Enter Acid as the variable for Single column, and 4 as the Subgroup size (for the 4 observations made per day). Select OK to obtain the control charts. Copy and past the control charts to your document.
- b. Is the process in control, as far as the level of the acid is concerned? Give a reason for your answer. Which chart did you use to answer this question?
- c. Is the process in control, as far as the variability in the amount of the acid is concerned? Give a reason for your answer. Which chart did you use to answer this question?
3. EXTRA CREDIT PROBLEM (not required). You will need to enter the data and figure out how to use Minitab to do these problems.
- a. (2 points) Use the data from Self-review 16-1 on page 587 to construct a Pareto chart in Minitab. What complaints would you suggest the administrator work on to achieve the most significant improvement? Hint: you'll probably need to use "help" in Minitab.
- b. (3 points) Do problem 23 on page 606. Use Minitab to construct the appropriate charts and answer the question.