**IE 4362 JMP Assignment 2**

**Directions:** Type your responses to each question in a Word document. All analysis should be completed using JMP. Type all answers and use JMP-generated tables and graphs in a single Word document.

Show all steps and all work. You may assume an alpha level of 0.05 unless otherwise noted. To answer each question, copy the output from JMP, showing enough detail to understand the analysis setup and the critical output used to answer the question. Then, type your answer based on this output, even if it means repeating the same numbers shown in the JMP output. This is your formal answer, supported by analysis in JMP.

There are 108 points total in this assignment. Points are broken down by problem.

Exception: you do not need to write out equations and numbers for finding means and standard deviations.

**Submitting your assignment: Put your name in the upper left corner of the first page.** Email the Word or pdf document. The file name must be in the following format: LastNameFirstInitial\_JMP1.docx or .pdf (10% penalty otherwise).

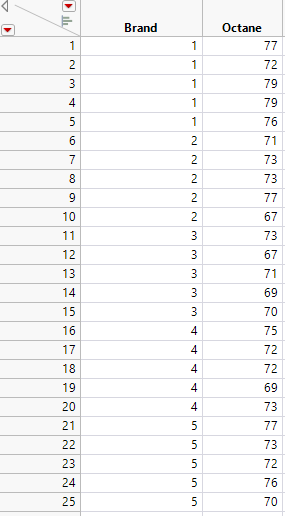
# Module 3

**Problem 1 (48 points):** An engineer wants to predict the seal strength on packaging used for gauze surgical sponges based on suspected significant variables of temperature, pressure, time, humidity, and vendor. One hundred observations were taken, and a subset of the data is provided in the Moodle assignment (IE4362\_JMP2\_P1).

1. First examine the dataset to determine which variables are meaningful and which might be correlated (and therefore unnecessary). Do this through 2 steps:
   1. (8) Examine the correlations between the input variables. Show the correlations table and discuss the relationship between each pair in terms of direction and strength.
   2. (12) Develop a scatterplot and simple linear regression model between seal strength and each input variable. Discuss which variables appear to have a meaningful impact on strength, and how you came to that conclusion.
2. Conduct a forward stepwise regression to find the best model of seal strength from the 5 input variables provided.
   1. (2) Based on the scatterplots and simple linear regressions developed in 1.b., which variable should be entered first?
   2. (5) Show the JMP output for the final model.
   3. (3) What is the overall significance of the model, and does it indicate a good fit for the data?
   4. (3) How much variance is explained by the model, and does it indicate a good fit for the data?
   5. (3) Which variables should be included in the final model, and why?
   6. (3) How much variance is NOT explained by the model? List a few potential causes for the unexplained variance.
3. (6) Write the final model equation and specify the ranges of each variable for which the model is valid.
4. (3) Evaluate the final model: Would you recommend that the engineer use this model to predict seal strength? Give a yes/no answer and reasoning.

# Module 4

**Problem 2** **(33 points total**): An experiment is carried out to compare 5 brands of gasoline. The data show 5 samples from the brands, measuring octane. We would like to know if there is a difference in octane levels between the brands.



1. (5) Describe the data by creating a bar graph using JMP to display the means and standard errors of scores for each brand.
2. (1) What is the dependent variable (outcome) in this experiment?
3. (2) What is the independent factor, and how many levels are there?
4. (13) Determine if the dataset meets the three ANOVA assumptions. Show all JMP output and provide a conclusion for each assumption. Provide an overall conclusion to answer whether we can use ANOVA on this dataset.
5. (5) Assuming part 4 is satisfactory, run an ANOVA to see if there is a difference in octane. Show the JMP output. State which numbers are useful in concluding, and state your conclusion in practical language.
6. (4) Run a Tukey HSD test to determine if specific brands differ in octane. Show the JMP output and discuss which pairs are significantly different.
7. (3 points) Overall conclusion: Is there a difference between brands on octane? Provide discussion on which types are better or worse in terms of outcomes. Support your answer with both statistical (numerical) evidence and practical interpretation. Be concise: answer the questions directly. You do not need any formal hypothesis testing.

# Module 5, through 2c

**Problem 3 (27 points):** Use the description and data in problem 14.4 in the textbook. DO NOT answer the questions in the textbook. Answer the items below:

1. (6) List the following variables for this experiment:
   1. Dependent factor(s):
   2. Main effect(s) and number of levels for each:
   3. Interaction effect(s):
2. (3) Set up a table in JMP to perform an ANOVA. Each variable (dependent and main effects) should be a separate column. Copy the table here.
3. Using ANOVA, answer the following:
   1. (6) Do the main effects significantly affect corrosion fatigue? Give a reason for each main effect including a statistic (number). Show the JMP output that supports your conclusions.
   2. (3) Is the interaction effect significant? Provide a yes/no answer and reason, including a statistic (i.e., p-value) and the JMP output to support the conclusion.
   3. (6) For significant effects only, use post-hoc analysis to determine the specific levels that have a significant effect on production rate. Show the post-hoc analysis results from JMP and provide a statistic (i.e., p-value) in your discussion.
4. (3 points) From a statistical perspective, which combination, if any, should be used to *minimize corrosion fatigue*? Provide the name of the combination and support your answer with the statistics provided.