

Due Date: _____

Math 2040 StatCrunch Exercise 3

The purpose of this exercise is to introduce you to some more features of the StatCrunch software that is available with your textbook and MyStatLab program. You will learn how to create a scatter diagram for bivariate data, find the regression equation that best fits the data, and determine whether or not a significant linear correlation exists.

Using the StatCrunch software, load the data for problem number 25 in section 4.1 of your textbook. (If you cannot recall how to accomplish this or any of the previously learned tasks, please refer to StatCrunch Exercises 1 and 2 which are posted in MyStatLab.) This data set contains the weights and gas mileage for 11 different cars.

First create a scatter diagram by clicking on “Graphics” then “Scatter Plot” on the toolbar at the top of the StatCrunch spreadsheet. For the X variable choose the Weight column and for the Y variable choose the Miles per Gallon column. Click next until you find the menu that allows you to enter labels and a title. Choose appropriate labels for your axes and a title that includes your name. Click on “Create Graph!” to see your results. Notice that the points do not form a perfect line, but they do seem to have an overall linear tendency. This scatter diagram would suggest that there might be a linear correlation between the weight of a car and the gas mileage of that car. **Copy your scatter diagram** into the document file that you will submit (Word is a good choice). Save this document. You will be adding to it!

Although looking at the plot is a great place to start, we cannot claim we have a linear relationship just by looking at the scatter diagram. We must calculate the linear correlation coefficient and compare it to the appropriate critical value in Table II in the textbook. In StatCrunch click on “Stat” on the toolbar at the top of the page. Select “Regression” and then “Simple Linear”. Again, choose the weight column as the X variable and the miles per gallon column for the Y variable. For now, click on “Calculate” at the bottom of this window. Looking at the information displayed, we can see that the correlation coefficient r is -0.9641 . The closer r is to -1 , the stronger the negative linear relationship between our X and Y values. Note that the negative relationship is due to the fact that as the weight increases, the gas mileage decreases and the slope of the regression line is a negative number. Even though r is close to -1 , we still must do a proper statistical analysis. Looking at Table 2 on page A-2 of the textbook (or on the formula card), we see that for a sample size $n = 11$, the critical value is 0.602 . If the absolute value of the correlation coefficient is greater than the critical value, then a significant linear correlation exists. Since $|-0.9641| > 0.602$, we conclude that there is a significant linear relationship between the weight of a car and its gas mileage.

Also note that the StatCrunch output gives the equation of the regression line that best fits the data.

$$\text{“Miles Per Gallon} = 44.87933 - 0.007036322 \text{ Weight”}$$

Another way to write this is $y = 44.87933 - 0.007036322x$. Remember that the coefficient of x in this equation is the slope of the line. Because we do have a significant linear correlation (tested by comparing r to the critical value) we could use this equation to make a prediction about gas mileage for

Due Date: _____

a car of a given weight. For example, a car that weighs 3000 pounds would have a predicted gas mileage of about 23.77 miles per gallon because $44.87933 - 0.007036322(3000) \approx 23.77$.

Before closing the regression output window, click on "Options" in the upper left hand corner and choose "Edit". Click on "Next>" at the bottom of the window until you come to a menu that says "Options:" at the top. Click the box to make a prediction and let $X = 2800$. Click "Next>" one more time and you will see the "Graphics:" menu. Check the box that says "Plot the fitted line". This will display the scatter diagram for the data with the equation of the regression line graphed as well. Click on "Calculate". The output shows the same information as before, but now includes the predicted gas mileage for a car weighing 2800 pounds. In the document file that you will submit, **report the linear correlation coefficient r , the linear regression equation, and the predicted gas mileage for a car weighing 2800 pounds**. Go back to the StatCrunch output and click "Next>" at the bottom of the window. Now you can see your scatter diagram and line. **Copy this graph** into the document file that you will submit and save your file.

Delete the car weight data and load the data for problem number 35 in section 4.1. This data is the base return of the stocks for several different companies from 1996 to 2007.

Using the skills you have just learned, determine if there is a linear correlation between the stock rates of return of Cisco Systems (X) and General Electric (Y). **Include the following** in the document file that you will submit:

1. The linear correlation coefficient and the linear regression equation.
2. The critical value for your sample size from Table II and state whether or not a significant linear correlation exists.
3. A copy of the Scatter Plot with fitted regression line.
4. Would the regression line give a good prediction of the General Electric stock rate of return when the rate of return of a Cisco Systems stock is 0.65? Explain why or why not.

Now, determine if there is a linear correlation between the stock rates of return of General Electric (X) and TECO Energy(Y). **Include the following** in the document file that you will submit:

5. The linear correlation coefficient and the linear regression equation.
6. The critical value for your sample size from Table II and state whether or not a significant linear correlation exists.
7. A copy of the Scatter Plot with fitted regression line.
8. Would the regression line give a good prediction of the TECO Energy stock rate of return when the rate of return of a General Electric stock is 0.27? Explain why or why not.

Print your document and turn it in by the posted due date.