CS130 Assignment #2

Date assigned: Monday, September 21, 2011
Date due: Monday, September 28, 2011
Points: 75

You are to add the following two worksheets to the Workbook you turned in for Assignment #1.

Worksheet #3 – named **Simulation**

Paramecia are unicellular micro-organisms that tend to feed on bacteria, algae, and yeasts. Take a look: http://www.youtube.com/watch?v=l9ymaSzcsdY.

We are going to do a simulation involving paramecia and bacteria to see how the populations change day by day given the following formulas:

$bacteria_{tomorrow} = (1 + a) * bacteria_{today} - c * bacteria_{today} * paramecia_{today}$

$paramecia_{tomorrow} = (1 - b) * paramecia_{today} + c * d * bacteria_{today} * paramecia_{today}$

where

a = 0.01	(fractional increase in bacteria population)
b = 0.005	(fractional decrease in paramecia population)
c = 0.00001	(likelihood that a paramecia will encounter and eat a bacteria)
d = 0.01	(fractional increase in paramecia population attributed to eating a bacteria)

You are to design a professional looking Excel worksheet to simulate the above problem for a period of 1000 days showing the Day, Bacteria, and Paramecia values for each day for 1000 days. Initial values for paramecia are 20 and for bacteria are 200. Allow the user the ability to enter and change values for initial paramecia, initial bacteria, a, b, c, and d at the top of the worksheet. Further, use named cells for initial paramecia, initial bacteria, a, b, c, and d. At the bottom of the Bacteria and Paramecia columns, report on the maximum and minimum number of each micro-organism during the given time period. Also, split the worksheet showing the top 12 rows and bottom 10 rows.

Create a Word document **PUNetIDAnswers.doc** using your PUNetID that will contain answers to each of the following questions. The questions are to be answered in order.

a) Create a graph (properly labeled) that shows the amount of Bacteria present for each day of the given time period. Paste your graph into the Word document under a heading **Problem #3 – Question 1**.

b) Create a graph (properly labeled) that shows the amount of Paramecia present for each day of the given time period. Paste your graph into the Word document under a heading **Problem #3 – Question 2**.

c) Under a heading **Problem #3 – Question 3**, answer the following question. What causes the rise and fall of the paramecia and why is the rise of the paramecia later than the rise of the bacteria? Completely and correctly answer this question.

Worksheet #4 – named **Crickets**

As crickets move their wings faster, the chirping sound produced becomes higher. It is believed that warmer ground temperatures cause crickets to move their wings faster. A study was done and here is the data:

ChirpsPerSecond	Ground Temperature (F)
20	88.6
16	71.6
19.8	93.3
18.4	84.3
17.1	80.6
15.5	75.2
14.7	69.7
17.1	82
15.4	69.4
16.2	83.3
15	78.6
17.2	82.6
16	80.6
17	83.5
14.1	76.3

1) Create a professional looking worksheet with the above data. Make sure the worksheet has a title and proper alignment is used. The above data in a worksheet would not be considered professional if the appearance doesn't change.

2) Perform a linear regression on the data. Make sure that the independent variable is on the X-axis and the dependent variable is on the Y-axis.

3) Paste a copy of the Scatterplot with the regression equation and R^2 value in your Word document under a heading **Problem #4 - Question 1**.

4) Would this correlation be considered a "strong" correlation based on our discussions in class? Why or why not? Answer this question in your Word document under the heading **Problem #4 - Question 2**.

5) If the ground temperature was 92 degrees, at what approximate rate would you expect the crickets to be chirping. Answer this question in your Word document to two decimal places under the heading **Problem #4 - Question 3**.

6) If the crickets were chirping about 16 times per second, what was the approximate ground temperature to two decimal places. Answer this question in your Word document under the heading **Problem #4 - Question 4**.

Notes for all worksheets:

- Changing any values of a worksheet must update the entire worksheet with accurate values based on the above formulas.
- I must be able to drag down your last row to get additional information or more refined answers.

Submitting your work:

You are to submit a folder called **PUNetID** that contains: (a) your **single** Excel workbook containing the four worksheets (two from the last assignment and two from this assignment) and (b) your Word document **PUNetIDAnswers.doc** that contains answers to each of the above questions. Remember, you must answer the above questions in the Word document in order; otherwise, you will lose points. You are to submit the **PUNetID** folder with the Excel workbook **PUNetID.xls** and **PUNetIDAnswers.doc** by 4:45pm on the day the assignment is due.

Grading:

Grading will be based on:

- Correctness of your results
- Completeness of your results
- Professional look of the worksheets as described above and discussed in class.
- Ability to perform a what-if analysis by changing any of the user input data with accurate results correctly displayed based on the changed data.

Start Early!!!