

CS130 Assignment #2

Date Assigned: 1/11/12
Date Due: 1/12/12 by 1pm
Points: 50

Continue adding the following worksheets to your Workbook called **PUNetID-Assignments**:

Worksheet #3 – named “Fleas”

You are to design a worksheet that simulates fleas on a dog over a 60 minute period of time. Your worksheet is to allow the user the ability to enter the following:

Cell	Meaning each minute	Value	Type
Flea Total	Number of fleas on the dog	50	Variable
Scratches	Number of scratches made by the dog	10	Variable
Scratch Rate		.05	Constant
Max Scratches	Maximum scratches the dog can make	20	Constant
New Fleas	Fraction of the fleas born or hopping on the dog	.2	Constant
Flea Death	Fraction of fleas dying or hopping off the dog	.1	Constant

For this simulation you are to use the above values in the following equations:

Scratches = the lesser of ((Scratch Rate * Flea Total) or Max Scratches)

$Flea\ Total_{next_minute} = Flea\ Total + New\ Fleas * Flea\ Total - Flea\ Death * Flea\ Total - Scratches$

Make sure that you allow the user the ability to enter any arbitrary values for each piece of data described above. Then show a table of Minutes, Scratches, and Flea Total in Next Minute below the data entered. All constant cells are to be named cells with the names being used in the formulas instead of the cell reference name such as A1.

Your final worksheet is to display the results using the above values, and must look like the following:

	A	B	C
1	Flea Total	50	
2	Scratches	10	
3	Scratch Rate	0.05	
4	Max Scratches	20	
5	New Fleas	0.2	
6	Flea Death	0.1	
7			
8			
9	Minute	# of Scratches	Flea Total in Next Minute
10	1	2.500	52.500
11	2	2.625	55.125
12	3	2.756	57.881

Finally, answer the following question starting with the initial values shown above:

1) What Scratch Rate will yield a Flea Total of 50 after 60 minutes? Place your answer as an Excel comment in cell D1. Make sure the comment is displayed when saving your worksheet.

Note1: You must use an IF formula to determine the number of scratches and no other functions with the IF formula.

Note2: I must be able to drag down your last row to get additional information.

The above problem idea came from [FORTRAN 77 For Humans](#) by Page.

Worksheet #4 – 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:

$$\text{bacteria}_{\text{tomorrow}} = (1 + a) * \text{bacteria}_{\text{today}} - c * \text{bacteria}_{\text{today}} * \text{paramecia}_{\text{today}}$$

$$\text{paramecia}_{\text{tomorrow}} = (1 - b) * \text{paramecia}_{\text{today}} + c * d * \text{bacteria}_{\text{today}} * \text{paramecia}_{\text{today}}$$

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 on day 0. 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 #4 – 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 #4 – Question 2**.

c) Under a heading **Problem #4 – 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.

How to Submit and Grading Policies

A copy of your single Excel file (properly named) with the two worksheets (properly named) is to be placed in the CS130 Drop folder by **1:00pm** on the due date to be considered on time.

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 computed and displayed in the worksheet.