Bash Homework 3

CS 6014 Introduction to Computation as a Research Tool

February 2013 Due: 6 Mar. 2013

Information for Submission Requirements:

- Upload your bash script as an attached file;
- Paste output from a sample run of the script into the textbox in Collab.

Background:

For this assignment, you will be writing a very simple predator/prey simulation in bash.

The idea behind the simulation is that you have two species (e.g., foxes and rabbits) where one species feeds off of the other. As long as the prey (e.g., rabbits) are plentiful, the predators (e.g., foxes) will thrive and increase in numbers. If there are too few prey, the predators will begin to starve and decrease in numbers. As soon as the number of predators drops below a certain threshold, the prey will begin to increase. Note: Although there are beautiful equations for modeling the dependencies between the predator and prey, we will use an over-simplified version with random numbers.

Most of the algorithms (and an explanation of generating random integers) are provided in the task descriptions, below. To implement the tasks, you will need to understand how to

- write functions in bash;
- write conditionals and loops in bash;
- write simple arithmetic expressions in bash.

These topics are covered in the slides in Collab, listed under Resources > Unix and Bash > Bash Scripting:

Tasks:

Write a bash script that includes the following:

1.Write a bash function called **randint** to obtain a random integer between variables lower_bound and upper_bound (the two input parameters). To do this you need to know that a special internal function $RANDOM (it's a function, not an environment variable) returns a random integer (always an integer) between 0 and 32767. You want to rescale it to be between lower_bound and upper_bound. This can be done using the modulo function, with the following steps:

a. First compute how many values exist between the lower_bound and the upper_bound (including both the lower and upper values). The formula for this is numValues = upper_bound – lower_bound + 1. For example, if lower_bound = 3 and upper_bound = 6, the possible integer values are 3, 4, 5, and 6. In this case, there are 6-3+1=4 possible values.

b. Generate a random number and take the modulo of it with numValues. This can be done with the following command:

```
number=$RANDOM
let "number%=$((numValue))"
```

c. Finally, create the new number by adding the random number to lower_bound.

2. Write a bash function called **deltaPop** to determine a change in a population number given a population size (as an input parameter). The function will return an integer that is randomly generated to be between 0 and populationSize/4, inclusive.

3.Write a bash script that will perform a (simplistic) simulation of a predator-prey environment. The algorithm for the script will be the following:

```
Set the predatorPopulation to 500
Set the preyPopulation to 500
Loop for 10 times:
        If the preyPopulation is greater than the
          predatorPopulation, then
                Decrease the preyPopulation by
                   deltaPop(predatorPopulation)
                Increase the predatorPopulation by
                  deltaPop(preyPopulation)

        Otherwise, if the preyPopulation is greater than the
          predatorPopulation/2
                Decrease the preyPopulation by
                   deltaPop(predatorPopulation)
                Decrease the predatorPopulation by
                  deltaPop(preyPopulation)

        Otherwise,
                Increase the preyPopulation by
                   deltaPop(preyPopulation)
                Decrease the predatorPopulation by
                  deltaPop(predatorPopulation)

        Write to the screen the iteration number, the number
           of predators , and the number of prey .
```

Note: You are on your honor to do your own work on this assignment.