CS0012 Introduction to Computing for the Humanities

Project 1 - **Lab3 – Final part**

In this part of the project you will have the computer run a large number of simulations of the prisoner's dilemma. We will assign both partnerAChoice and partnerBChoice a value using randint(), which will allow us to run hundreds of trials in very little time.

When your program begins, it should first prompt the user for a number of trials (save it to ***runs***) to simulate (integer between 10 and 500). After that, it should simulate each partner making the specified number of choices, each time assigning a random value to both partner A and partner B. After the specified number of trials have been completed, your program should print out the average number of years served by partner A across all trials, and the average number of years served by partner B across all trials.

Part 1: Running n simulations

Let's start by designing a loop that can run a simulation a given number of times. Write a loop that will iterate **5** times and calculates 4 values:

partnerAcount - the first is the total number of years partner A has had to spend in jail,

partnerBcount - the total number of years partner B has had to spend in jail.

the average for **partnerAcount,** average for **partnerBcount** (after the 5 runs). You can print the result to screen to check if the numbers are correct.

```
print("Partner A spent", partnerAcount, "years in jail")

print("Partner B spent", partnerBcount, "years in jail")
```

Part 2: User-specified number of trials

Next, you should modify your program to run a user-specified number of trials instead of a preset 5 trials run. You should allow the user to enter a value between 10 and 500. You must use input validation to ensure that the user enters a value between 10 and 500 (though if the user does not enter an integer, it is acceptable for your program to crash). To do this, write a while loop that will continuously prompt the user for a number of trials until they enter an integer between 10 (inclusive) and 500 (inclusive). Here is the output from a run of the desired program:

```
How many trials should be simulated? 5000
Please enter a number between 10 and 500
How many trials should be simulated? -1
Please enter a number between 10 and 500
How many trials should be simulated? 350
```

```
Partner A did an average of 3.06 years in prison
Partner B did an average of 2.93 years in prison
```

Part 3: Adding additional strategies

We will now add additional strategies for the computer to use in order to run more interesting simulations. For this project, we will add only two simple strategies: Only-Silent (always chooses to stay silent) and Only-Cooperates (always chooses to cooperate). Before being prompted for the number of trials to run, the user should set the strategy of each partner from the 3 available: Random, Only-Silent, Only-Cooperates.

In order to ensure that the user enters a valid strategy, you will need to write another loop that will continuously prompt the user for a strategy until they enter a valid value.

You will also need to modify the simulation loop to accept the strategies. The strategies should be named partnerAstrategy and partnerBstrategy, and should specify which strategy each partner should use (Random, Only-Silent, or Only-Cooperates). The simulation loop should then consult these arguments when determining each partner's action each trial (i.e., decisions should now only be randomly made if the Random strategy is employed). Here is output from a run of the desired program:

```
3 strategies available:
1: Random
2: Only-Silent
3: Only-Cooperates

Select strategy for partner A
Please enter a strategy: 5
Must enter a number between 1 and 3
Please try again
Please enter a strategy: -2
Must enter a number between 1 and 3
Please try again
Please enter a strategy: 2

Select strategy for partner B
Please enter a strategy: 3

How many trials should be simulated? 500
Partner A did an average of 6.00 years in prison
Partner B did an average of 0.00 years in prison
```

Once you have this part of the lab working, show your work to the lab instructor and submit your finished project solution for grading.

Further thoughts

When you started this project, what did you feel would be the best strategy for someone to employ if they found themselves in this situation? How has working on this project changed your thoughts on what the best strategy would be? What other strategies can you think of to implement?