**Bios 531 Final Version 3**

**Part A (60 points)**

Simulations are helpful in empirically demonstrating statistical results. In this set of projects, you will be using SAS to write a simulator for a “popular” dice game called GOLO. This homework problem is based on the original version of the game, which uses nine 12-sided dice to create a simulation of nine holes of real golf. Obviously, rolling dice to simulate golf can be much less physically taxing, considerably less frustrating and somewhat less dangerous than actual golfing. It should be noted however that depending on the ages of participants (and in the case of graduate students, relative sobriety) it may be just as likely to lose a die as it is to lose one’s ball in the rough.

For this project, you are being asked to design a simulation of GOLO by teaching SAS how to play the “simple” game and then getting SAS to play it 1,000 times. The simple game follows these rules:

1. Each die has 12 irregularly-numbered sides
2. The values on each dice are as follows:

|  |  |
| --- | --- |
| Score | Frequency |
| -1 (birdie) | 1 |
| 0 (par) | 3 |
| 1 | 2 |
| 2 | 2 |
| 3 | 3 |
| 4 | 1 |
|  |  |

1. On the first turn, all nine dice are rolled and the lowest score is selected (simulating the first hole played). This die is then removed from the pool of remaining dice
2. On subsequent turns, the remaining dice are rolled, the lowest score is selected and that die is removed
3. The half ends when all nine dice are removed and nine scores have been recorded. Retain the scores for the half and then repeat steps #3 and #4 to generate a simulation of a full round of golf (18 holes in total).

There are various alternative strategies one can use in playing this game apart from the simple strategy of one hole at a time. Here are some other strategies to consider:

* Modification 1: Select **all dice** (play one round)
* Modification 2: Select all (birdies) or lowest die

The deliverable for this project is a single program which, when run, will produce a SAS dataset with 1000 GOLO results and a short statistical summary of the simulation for each of the 3 different strategies presented here 20 points for each strategy).

Deliverables:

1. Code simulating 1000 games of GOLO with the scores for all eighteen holes with a variable keeping the total score for each half and the final total for the round for each of the 3 strategies. Each strategy should have its own separate code in the SAS program (i.e. we want to see at least 3 separate sections even though they may look very similar)
2. Summary table showing the mean round total for each strategy on eighteen holes. This table should be produced by the program and the call should follow each simulation section.

**Part B**

Macrify your code from part A

Deliverable (40 points):

Write a SAS Macro that allows the user to specify a strategy (simple, modification 1, modification 2) and play a user-specified number of games with that strategy. The user should be allowed to define a seed, library name, dataset name, and whether the user would like to see the results summarized in a table. The title on the output should reflect all of the user-defined choices specified when the macro is called. Full points will be awarded for a fully-working macro.