

## CS 100 Lab Four – Spring 2019

Create a directory called **lab4** on your machine using **mkdir lab4** and move into that directory with **cd lab4**. Complete the following programs.

1. Name this program **rps.c** – This program simulates two people playing the game “rock-paper-scissors” and prints the results after playing a number of games. The program first prompts the user for the number of games to play. It then “plays” that many games. For each game, it generates two random numbers between 0 and 2 – one for each player – and determines the winner of that game. The program defines the following numbers: **ROCK=0**, **PAPER=1**, and **SCISSORS=2**. The main program, shown below, counts the number of times each player won and then prints the results. For example, playing 10 games on the cs-intro server generates the output **There were 3 ties, 5 player one wins, 2 player two wins**

```
#include <stdio.h>
#include <stdlib.h>
#define ROCK 0
#define PAPER 1
#define SCISSORS 2
// Print the prompt, scan in an integer, and return it.
int getInt(char prompt[]);
// Return 0 for a tie, 1 if player 1 won, and 2 if player 2 won
int findWinner(int p1move, int p2move);
// Print three results in the order of ties / player1 wins / player2 wins
void printResults(int numTies, int numP1Wins, int numP2Wins);
int main(void)
{
    int games=getInt("Enter the number of games to play: ");
    srand(0);
    int ties=0, p1wins=0, p2wins=0;
    for (int a=0; a<games; a++) {
        int p1 = rand() % 3;
        int p2 = rand() % 3;
        int ans = findWinner(p1, p2);
        if (ans == 0) ties++;
        if (ans == 1) p1wins++;
        if (ans == 2) p2wins++;
    }
    printResults(ties, p1wins, p2wins);
    return 0;
} // downloadable from Blackboard
```

Your job is to implement the three functions listed above. You are not allowed to modify anything else.

2. Name this program **stat.c** – This program below calculates the mean and the standard deviation of an array of integers. Your job is to implement the four functions listed below. You are not allowed to modify anything in the **main** function. To compile the program, please use **gcc -Wall -std=c99 stat.c -lm**

```
#include <stdio.h>
#include <math.h>
int getInt(char prompt[]);
void getData(int array[], int size);
void calcMeanStdDev(int array[], int size, double *pMean, double *pStdDev);
void printResults(double mean, double std_dev);
int main(void)
{
    int size=getInt("Enter the array size: ");
    int array[size];
    getData(array, size);
    double mean, std_dev;
    calcMeanStdDev(array, size, &mean, &std_dev);
    printResults(mean, std_dev);
    return 0;
} // downloadable from Blackboard
```

Please see <https://www.mathsisfun.com/data/standard-deviation.html> for the math involved.

### Submit your lab

First, on your local machine, compress your **lab4** directory into a single (compressed) file, i.e. **lab4.zip**. Second, once you have a compressed file named **lab4.zip**, submit that file to Blackboard.