CSC 212: Data Structures and Abstractions
University of Rhode Island
Fall 2018
Weekly Problem Set #1

This assignment is due Thursday 9/20 before lecture. Please turn in neat, and organized, answers hand-written on standard-sized paper **without any fringe**. The only library you're allowed to use in your answers is `iostream`, though you can test with whatever you'd like. Problem set 1 is about strings, arrays, functions, and pointers, some of the most fundamental concepts in C/C++ programming.

1. Provide a sequence of Bash commands that will:

   - go to your default home directory;
   - create a directory test;
   - rename test to myproject;
   - enter the directory myproject;
   - create a new empty file main.c;
   - list all files in myproject, including hidden files;
   - return to the parent directory.

2. Provide a sequence of Bash commands that will:

   - create files a.txt, b.txt, and c.txt;
   - write the line a: 1 2 3 4 5 to a.txt;
   - write the line b: 6 7 8 9 10 to b.txt;
   - write the line a: 11 12 13 14 15 to c.txt;
   - concatenate a.txt, b.txt, and c.txt into all.txt.

3. Write a function that returns the length of a given string. For example, given `"Test"`, return `4`.

4. Write a function that returns the number of words in a given string. Words are always separated by whitespace or tab characters.

5. Write a function that returns a missing number in an array of integers ranging from 1 to n. For example, given $[3, 2, 1, 5]$, output `4`.

6. Define a function that returns the average of the minimum and maximum elements in an unsorted array of integers. How would this code change if the input array is sorted?

7. Draw the array represented by `int arr[5];` use null to denote uninitialized memory.

8. Now redraw the array after this code executes:

```
*arr = 1;
*(arr+2) = 5;
```

9. Define a void function that takes a pointer to an integer variable as a parameter, and increments its value by 10. (hint: void functions return type is void)

10. What is the output of the following code? If it breaks at any point, indicate what went wrong.

```
#include <iostream>

int mystery(int x, int *y) {
    x = x + 10;
    *y = x * 2;
    return x;
}

int* mystery2() {
    int x = 50;
    return &x;
}

int main() {
    int x = 2, y = 3;
    x = mystery(x, &y);
    std::cout << "(x, y): (" << x << ", " << y << ")" << std::endl;
    int *z = mystery2();
    std::cout << "z: " << *z << std::endl;
}
```

11. Write a program that removes any duplicate integers from an input array and prints the resulting array. For example, given $[1, 2, 2, 3, 4, 2, 5]$, the program should print $[1, 2, 3, 4, 5]$.