Honors Introduction to C
Exam #2
10/23/2017

Name: _____

Directions: Please answer questions 1 - 5 in C, and questions 6 - 8 in C++.

Part I - C

1) (10 pts) Write a function that takes in a single positive integer, *n*, and returns the number of divisors the integer has. For example, 6 has four divisors: 1, 2, 3 and 6. Please do NOT put any printfs or scanfs in your function. (Note: The solution in C or C++ is virtually identical.)

```
int numDivisors(int n) {




}
```

2) (10 pts) Write a function that takes in a single positive integer *n* and returns the sum of the digits of *n*. For example, if *n* = 5234, then the function should return 5 + 2 + 3 + 4 = 14.

```
int sumDigits(int n) {




}
```

3) (10 pts) What is the output of the following program?

```
#include <stdio.h>
int main() {
    int a = 3, b = 7;
    b = f(a+b, b-a);
    printf("a = %d, b = %d\n", a, b);
    a = f(b, a);
    printf("a = %d, b = %d\n", a, b);
    return 0;
}

int f(int a, int b) {
    int c = 2*b - a;
    a = 13%(b+a);
    b = c - a;
    printf("a = %d, b = %d, c = %d\n", a, b, c);
}
```

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4) (10 pts) What is the output of the following program?

```
#include <stdio.h>
int main() {
    int a = 4, b = 5;
    b = f(&a, &b);
    printf("a = %d, b = %d\n", a, b);
    a = f(&b, &a);
    printf("a = %d, b = %d\n", a, b);
    return 0;
}

int f(int* a, int* b) {
    int c = 2*(*b) - (*a);
    *a = 13%((*b)+(*a));
    *b = c - (*a);
    printf("a = %d, b = %d, c = %d\n", *a, *b, c);
}
```

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5) (15 pts) Write a function that takes in an integer array, its length, and returns the range of the values in the array. The range of a set of numbers is defined as the largest of the numbers minus the smallest of the numbers.

```
int range(int* array, int length) {



}
```

Part II - C++

6) (5 pts) Write a void function in C++ that takes in an integer variable by reference and adds one to it (so that the change is reflected in that variable later.) Please call your function increment and have it take in an integer by reference called x.

7) (12 pts) Write a segment of code in C++ that asks the user to enter an integer n, reads it in, dynamically allocates an integer array of size n, and then reads in (without any prompt) n integers into the array, in order.

8) (25 pts) Write a program in C++ that reads in input from the file "data.txt". The first line of data.txt has a single positive integer n. The following n lines have one integer each, each in between 0 and 10, inclusive. Read in this data and store it in an array, freq, of size 11, where freq[i] stores the number of times the value i was in the data. Then, print out (to standard output, cout) the data in a horizontal bar chart. For example, if the data was 3, 3, 3, 6, 8, 2, 9, 10, 0, 0 your program should print out what's below. You may assume that the no number will appear in the data more than 10 times.

```
      *
*     *
*   * *     *   * * *
0 1 2 3 4 5 6 7 8 9 10
```

```
using namespace std;

#include <iostream>
#include <fstream>

int main() {









    return 0;
}
```

9) (3 pts) Sweet by Holly's Black and Gold cupcake is inspired by what Orlando University? (Hint: The end of the online description of the cupcake reads, "Go Knights!")

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Scratch Page - Please clearly mark any work on this page you would like graded.