Exam 2

CSI 201: Computer Science 1
Fall 2016

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Question	Points	Score
1	18	
2	29	
3	18	
4	15	
Total:	80	

I understand that this exam is closed book and closed note and is to be completed without a calculator, phone, or other computer. I am **NOT** allowed to use any external resources to complete this exam. All of the work that I am submitting for this exam is mine. I have completed this exam in accordance with the Washington College Honor Code.

Name: _____

Signature: _____

Section: **10**: 11:30-12:20 **11**: 1:30 - 2:20

1. **Concepts.** Answer each question briefly.

   (a) [3 points] How many elements are in the following array?

```
bool on_time[43];
```

   (b) [3 points] How are arrays and pointers related?

   (c) [3 points] What important C++ rule does this function definition break?

```
int[] makeArrayOfTenZeros() {
    int arr[10];
    for (int i = 0; i < 10; ++i)
        arr[i] = 0;
    return arr;
}
```

   (d) [3 points] Describe one possibility that could happen when this code is run:

```
double * four_elements = new double[4];
cout << four_elements[100];
```

   (e) [6 points] Explain the differences between static and dynamic arrays.

2. **Short Coding Questions.** Write a line or two of code to answer each question.

   (a) [3 points] Show how to call a function called `printInstructions`. Here is this function's prototype: `void printInstructions();`

   (b) [3 points] Write a line of C++ code to print out the value of the first element of an array called `zebras`.

   (c) [3 points] Show how to free up the memory that is being used by the array `arr`, which was created like this:

   ```
   double * arr = new double[15];
   ```

   (d) [3 points] Write a prototype for a function called `printArray` that takes as input an array of type `double` and an integer length of the array. The function will not return anything.

   (e) [3 points] Give a line of code to change the last element of an integer array to be equal to the second element of that array. The array is called `puppies` and the size variable is called `N`.

(f) [4 points] Show how to declare a new array of `doubles` with 10 elements in two ways: (1) as a static array, and (2) as a dynamic array.

(g) [5 points] Give several lines of code that set every element of an array to `-1`. You should assume that the array is called `choices` and that the length of the array is stored in a variable named `N`.

(h) [5 points] Write a for loop to print every even-indexed element of an array to the console. You may assume that array has been declared and initialized elsewhere and is named `sodas`, and that the size of the array is stored in an `int` named `num_drinks`.

3. **Code Output.**

(a) [3 points] What is the console output of the following code snippet?

```
for (int q = 10; q > 4; q -= 2) {
    cout << q - 2 << endl;
}
```

Output:

(b) [3 points] What value does the function call `foo(12, 12, 12)` return?

```
double foo(int num1, int num2, int num3) {
    num1--;
    if (num1 < num2)
        num3 = num3 - 2;
    return num3 - num1;
}
```

(c) [3 points] Consider this definition for the function `h`:

```
int h(int b, int a) {
    return b;
}
```

What is the output of these lines of code?

```
a = 4;
b = 8;
cout << h(a, b);
```

Output:

(d) [4 points] Suppose that the function `f` is defined like this:

```
void f(int arr[], int size, int i){
    if (i < size)
        arr[i] = 7;
}
```

What is the console output of this code snippet?

```
int numbers[4];
numbers[2] = -5;
f(numbers, 4, 2);
cout << numbers[2] << endl;
```

Output:

(e) [5 points] What is the console output of the following code?

```
#include <iostream>
#include <string>
using namespace std;

int function1(int a, int b);
int function2(int a, int b);

int main() {
    int a = 2;
    int b = 1;
    cout << function1(a, b) << endl;
}

int function1(int a, int b) {
    a = function2(a, b);
    if (a >= 3) {
        return a;
    }
    else {
        return a + 3;
    }
}

int function2(int a, int b) {
    return a * 2 + b;
}
```

Output:

4. [15 points] Write a function to compute the evaluation of the algorithm described below. Use good programming practice, and choose proper return types and parameter values.

   Also write a `main` that demonstrates at least one function call of this function.

   Algorithm: In math, the *length of a vector* of numbers is defined as the square root of the sum of the squares of the numbers. For example:

$$\begin{aligned}\text{length}([1, 4, 6, -2]) &= \sqrt{(1)^2 + (4)^2 + (6)^2 + (-2)^2} \\ &= \sqrt{1 + 16 + 36 + 4} \\ &= \sqrt{57} \approx 7.55\end{aligned}$$

   Write a function that computes this *vector length* for any array of numbers.

   Clarification: You may *not* assume that input arrays always have 4 elements (like in the example). Your function must be general to any length array.