Final Exam

CSI 201: Computer Science I
Fall 2016
Professors: Shaun Ramsey and Kyle Wilson

Question	Points	Score
1	18	
2	16	
3	12	
4	8	
5	10	
Total:	64	

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 my own, and has been completed in accordance with the Washington College Honor.

Name: _____

Signature: _____

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

1. Short coding questions

   (a) ☐ 4 points ☐ Write two loops: one `for` loop, and one `while` loop. Both of them should do the same thing: print the numbers 1 through 1000.

   (b) ☐ 2 points ☐ Write a line of code that creates a new dynamic array of size `N` called `temperatures`.

   (c) ☐ 2 points ☐ Show how to release the memory used by the array in the previous question.

   (d) ☐ 2 points ☐ Write a line of code that doubles the value of a variable called `x`.

   (e) ☐ 2 points ☐ Write a line or two of code that creates a variable called `Pi` and initializes it to 3.14159.

(f)   2 points   Write a few lines of code that increase a variable called x by 2, only if x is an even number.

(g)   2 points   In a few lines of code, define a function called `plusOne` that takes one parameter (a double called `x`) and returns `x+1`.

(h)   2 points   Consider the following class definition:

```
class Coordinate {
public:
    double latitude;
    double longitude;
};
```

Show (in a few lines of code) how to a create new variable named `washcoll` of type `Coordinate` with latitude/longitude values of 39.22 and 76.06, respectively.

2. Code Output.

   (a) 10 points Determine what is printed by each code snippet.

Code Snippet:	Output:
```cpp int a = 4; int b = 5; cout << a * b << endl; cout << a / b << endl; ```	
```cpp int a = 17 - 4; if (a % 2 == 0) { a = 7; } cout << a; ```	
```cpp double x = 3.59; if ((5.0 < x) && (x < 7.0)) cout << x + 4 << endl; else if ((5.0 < x) || (x < 7.0)) cout << x + 3 << endl; cout << x + 2 << endl; ```	
```cpp int i = 0; while (i <= 16) { i = i + 2; } cout << i << endl; ```	
```cpp int data[5]; for (int i = 0; i < 5; ++i) data[i] = i - 1; cout << data[3]; ```	

(b) 4 points Consider this function definition:

```
void fillArray(double[] array, int N) {
    double temp = array[0];
    for (int i = 1; i < N; ++i)
        array[i] = temp;
}
```

What is the output when we run the following code snippet?

```
double * nums = new double[20];
nums[0] = 3.1;
nums[1] = 3.2;
fillArray(nums, 20);
cout << nums[0] << endl;
cout << nums[1] << endl;
```

(c) 2 points Consider this function definition:

```
void f(int a, int b) {
    b = 2;
    a = a - b;
}
```

What is the output when we run the following code snippet?

```
int a = 0;
int b = -1;
f(b, a);
cout << a << endl;
cout << b << endl;
```

3. Concepts: answer each question briefly.

   (a) ☐ 2 points ☐ What is an array index?

   (b) ☐ 2 points ☐ What does `endl` do?

   (c) ☐ 2 points ☐ List the boolean operators.

   (d) ☐ 2 points ☐ Why do we make class variables private?

   (e) ☐ 2 points ☐ Is this expression true, or false?

   ```
   true && !(false || !false)
   ```

   (f) ☐ 2 points ☐ Which of the following is not a part of the process of turning `C++` code into a working program? (Circle one)
   - linking
   - preprocessing
   - indexing
   - compiling

4. 8 points Debugging. The code below defines a function for asking the user to type in a positive number. It uses an input checking loop to keep asking until the answer is valid.

Find all four bugs in this function. For each bug, write what the mistake was, and on what line it occurs (if possible). Each mistake is worth 2 points.

```
1.  int getPositiveNumber {
2.      while (x <= 0) {
3.          cout << 'Type a positive number: ";
4.          cin >> x;
5.      }
6.      return x
7.  }
```

Error 1. _____ Line #: _____

Error 2. _____ Line #: _____

Error 3. _____ Line #: _____

Error 4. _____ Line #: _____

5. Programming.

   (a) ⟨5 points⟩ The *Ell* is an archaic unit of measurement. Write a unit converter program that converts from inches to ells. The conversion formula is:

   ```
   ells = inches / 45
   ```

   The program should ask for an input distance in inches, and then it should print out the converted distance in ells. For this problem, you should write out every line of code that would go in your complete `.cpp` file.

(b) $\boxed{\text{5 points}}$ Write a class definition for a class called `WaterBottle`. It should satisfy these specifications:

- It has one private variable: `current_amount`.
- It has a public function called `drink`, which takes a parameter `x` and reduces the `current_amount` by that much.
- It has a public function called `dump` which takes no parameters and sets `current_amount` to 0.
- It has a public accessor function called `getCurrentAmount`.
- It has a public one-parameter constructor which sets `current_amount` to a given value