Row	Seat

Final Exam CSCI 135 Version 1: Programming Design and Analysis

Hunter College, City University of New York

Final Exam Date and Time:19 May 2022, 11:30 – 1:30 PM

Exam Rules
- Show all your work. Your grade will be based on the work shown.
- The exam is closed book and closed notes.
- When taking the exam, you may have with you pens and pencils, and the cheat sheet provided.
- You may not use a computer, calculator, tablet, phone, earbuds, or other electronic device.
- Do not open this exam until instructed to do so.

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

I understand that all cases of academic dishonesty will be reported to the Dean of Students and will result in sanctions.								
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Initial:

1. Short answer questions (3-point each).

   (1) Suppose class Undergraduate is derived from class Student, which class is a superclass?

   (2) Declare an array of strings, call it **names**. Initialize with “Ann”, “Bob”, “Charles”.

   (3) Write code to print 1, 2, 4, 8, 16, …, 1024 = 2^{10}, where the next item is twice of the previous one.

   (4) Given function bool isPrime(int n), which return true if n is a prime integer, false otherwise. Write code to find out **how many** prime integers are in [1, 100].

   (5) Given int arr[] = {1, -2, 97}; and int *p = arr; What is the value of *(p+2)?

Initial:

(6) Given a **struct** called Dog, which includes the following data members: breed as a string and weight as a double. Suppose diesel is declared as a variable of Dog. **Write code** to set the weight of diesel to be 25.6.

(7) What is output for the following code?

```
vector<int> nums;

for (int i = 0; i < 10; i++)
    nums.push_back(i);

for (int i = 0; i < nums.size(); i++)
    if (nums[i] % 2 == 0)
      cout << nums[i] << endl;
```

(8) Read the following code. What is the output?

```
int arr[] = {5, 2, 3, 1};
int size = sizeof(arr) / sizeof(arr[0]);

for (int i = 0; i < size-1; i++)
   if (arr[i] > arr[i+1])
     swap(arr[i], arr[i+1]); //function to exchange two given parameters

for (int i = 0; i < size; i++)
   cout << arr[i] << endl;
```

Initial:

(9) Declare and initialize a two-dimensional string array called arr with two rows. The first row is “big”, “medium”, “small”, the second row is “smile”, “giggle”, “laugh”.

(10) Declare the **header** of a function called **sort**, which takes two integers, if the first one is larger than the second one, swap them. Return type is **void**. No need to define the function, **just define the header of the function**.

2. Declare an int variable called it size and initialize it to be 10. Create a **two**-dimensional dynamic allocated memory array, call it data, which has size rows, and row indexed at i has (i+1) columns, where i is the index of row and starts from 0.

Set each element of data to be a random int in [60, 100].

Release dynamically allocated memory of data and handle dangling pointer problem.

Initial:

3. Define a **class** called Date, which includes data members, year and month, both as ints.
    - Data member year is an astronomical year, where year 0 means 1 BC, and counts negative years from 2 BC backward (−1 backward), so 100 BC is −99 (per wiki). So, year can be negative.
    - Data member month is an integer between 1 and 12.

    Define a default constructor, set year to be 1900 and month to be 1.

    Define method nextMonth, which add one month to current date. You need to consider the case when current month is December or not.

    In main function, create a Date object using default constructor, and call its nextMonth method.

Initial:

4. Define a function, for a given array of strings, its size, and a target string, return the index of the **last** occurrence of that target if found, otherwise, return -1.

5. Define a function, for an array of integers and its size, return a vector consisting of only positive integers in this array.

Initial:

6. Define class square pyramid.
   (1) Data member are side and height, both may contain decimal numbers.
   (2) Define non-default constructor which takes two formal parameters side and height, if this given parameter side is positive, use it to initialize data member side, otherwise, initialize data member side to be 1. If given parameter height is positive, use it to initialize data member height, otherwise, set data member height to be 1.
   (3) Define a method to reset data member side. If the given parameter is positive, then use it to reset data member side, otherwise, do not change the side of the current object.
   (4) Define a method to get data member side.
   (5) Define a method to get the volume of a square pyramid. The formula is $1/3(side)^2 height$.

Initial:

7. Define a **recursive** function that test whether a given string contains only letters ‘a’ or ‘b’. Also, an empty string by definition is not a string contains only letter ‘a’ or ‘b’.
   Hint: for base cases, you may need to consider a string has no letter or a string has only one letter.

Note that if you do not use recursion, you will not get any point. No repetition statement is allowed in this function.