University of California, Los Angeles November 3rd, 2021 PIC 10A: Introduction to Programming Fall 2021, Section 3 Instructor: Minh Pham

Midterm

Read all of the following information before starting the exam:

1. The test is open book, open note, open Visual Studio 2019, **but not open internet**. 2. Do not use material beyond the class. Only use materials taught in the lectures and discussion sessions.
3. No collaboration, no cheating. Plagiarism is not tolerated.
4. You have two options for submission:
    a. Download this file, and write your solutions in the space below the questions, convert this file to pdf or image files, or take pictures of these pages.
    b. Type your solutions in MS word, then convert it to a pdf file.
5. When submitting through Gradescope, please match your solution page with the outline.
6. This test has 10 questions which are worth 100 points.
7. Please follow instructions closely and attempt all problems. Incomplete answers still get partial credit while no attempt definitely gets zero.

Statement of Academic Honesty:

For this exam, I make the following truthful statements:

● I have not received, I have not given, nor will I give or receive, any assistance to another student taking this exam, including discussing the exam with students in another section of the course. ● I will not use any non-instructor approved electronic device to assist me on an exam. ● I will not plagiarize someone else's work and turn it in as my own.

By signing below, I declare that this exam represents my own work in accordance with University policy.

Name: Le'on Norfleet **Student ID:_305_771_450**

Signature: Leon Norfleet **Discussion session:_3D__**

Part I: (34 points) Short-answer and multiple choice questions

1. (5 points) How many times does the following loop execute its body? Explain your answer.

```
for ( int i = 10; i <= 184; i+=6 ) {
    // assume i is unchanged in the body of this loop
    ...
}
```

Answer:___The function runs 31 times. It starts at 10; and continues to run while increasing by 6 until it reaches 184. It runs one more time due to the greater than or equal to symbol, making the total amount of times ran

31.____

____

____

____

2. (4 points) Complete the following code to generate a random integer between -10 and 10 inclusively (including both -10 and 10).

```
    int x = ___?___;
```

Answer:__int x = rand() % (21) - 10;____

____

3. (4 points) Show all integer values of variable x that make the following expression true?

```
    (x>=1) && (x<26) && ( x%5==1 || x%8==2 )
```

Answer:__The values of 1, 2, 6, 10, 11, 16, 18, 21 make the expression true____

____

____

____

____

4. (6 points) True or false? No need explanation

a. A function can have multiple return statements.

Answer: True

b. A function with return value void must print a result

Answer: False

c. A function can return more than one value.

Answer: False

d. A variable that is declared inside a loop is no longer available after the loop.

Answer: True

5. (5 points) The following code defines a function. Show all (run-time) errors if there are any. Assume that `eps` is positive.

```
double aFunction( double x, double eps ) {
     if ( x < -eps ) return x + eps;
     if ( x > eps ) return x - eps;
}
```

Answer:___error/missing return value if x = 0 or x =

eps____

____

____

____

____

6. (5 points) Assume x is an integer of type `int`. Complete the following if-statement to check whether x satisfies all of the following conditions:

- x is between 1 and 200 inclusively,
- x is divisible by either 12 or 17 if x is in the range [1,100].

```
if(____?____) {
    cout << "x satisfies all conditions." <<endl;
}
```

Answer: _if ((x >= 1 && x <= 200) && (x >= 1 && x <= 100) && (x % 12 == 0 || x % 17 == 0)) {

}___________________

7. (5 points) Sort the following strings in the ascending (Lexicographic) order

```
chute, churSt, church, chuRros, chur
```

Answer: _chuRros, chur, churSt, church, chute_______________________________________

Part II: (66 points) Coding

8. (22 points) Write a function named `alternatingInverseSum` that takes a positive integer (of type `int`) N as an argument, and returns the alternating sum of the inverse of integers from 1 to N. For example, if N is odd, let say N=9, the function computes and returns value of the following sum: $1 -{}^{1}{}_{2}+{}^{1}{}_{3}-{}^{1}{}_{4}+{}^{1}{}_{5}-{}^{1}{}_{6}+{}^{1}{}_{7}-{}^{1}{}_{8}+{}^{1}{}_{9}$

If N is even, for example N=10, the function computes and returns the following sum: $1 -{}^{1}{}_{2}+{}^{1}{}_{3}-{}^{1}{}_{4}+{}^{1}{}_{5}-{}^{1}{}_{6}+{}^{1}{}_{7}-{}^{1}{}_{8}+{}^{1}{}_{9}-{}^{1}{}_{10}$

If N is less than or equal to 0, returns 0. Do not use the `pow()` function.

```
double alternatingInverseSum(int N) {

double sign = 1.0;

     double sum = 0;

     if (N <= 0) {

          return 0;

     }

     else {

          for (double i = 1.0; i <= N; i+=1.0) {

               sum = sum + sign * (1.0 / i);

               sign = -sign;
```

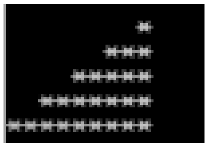
```
            }

            return sum;

      }

 }
```

9. (22 points) Write a function named `drawTriangle` that take a positive integer (of type int) N, and draw a right triangle using the asterisk symbol *, where the sides are N and 2N-1. For example if N=5, then the function will display a right triangle where height = 5 and base = 9 as follows:



```
        *
       ***
      *****
     *******
    *********
```

```
void drawTriangle( int N ) {

for (int i = 0; i < N; i++) {

            int form = N - i;

            cout << setw(2 * form - 1);

            for (int j = 0; j <= 2 * i; j++) {

                  cout << "*";
            }

            cout << endl;

      }
}
```

10. (22 points) Write a piece of code that asks the user to enter three positive integers a, b, and c, then

- print "a is divisible by both b and c" if a is divisible by both b and
c, ● print "a is divisible by b only" if a is divisible by b but not c,
- print "a is divisible by c only" if a is divisible by c but not b,
- print "a is not divisible by both b and c" if a is not divisible by either b or c

You will need to replace a, b and c by specific values. For example, if a=24, b=6, c=7, then print "24 is divisible by 6 only". You can assume the user always enters valid inputs, i.e. a,b, and c are positive integers.

Requirement: You have to use multiple alternatives to write no redundant comparisons. Single if statements or mixed nested if statements only get partial credits of maximum 18 points.

```
#include <iostream>

using namespace std;

int main() {

     int a, b, c;

     cout << "Enter 3 positive integer(s): ";

     cin >> a >> b >> c;

     bool case1 = (a % b == 0);

     bool case2 = (a % c == 0);

     if (case1 && case2) {

          cout << a << " " << "is divisible by both" << " " << b <<
" " << "and" << " " << c;

     } else {
          if (case1) {
               cout << a << " is divisible by " << b << " only" <<
endl;
          } else if (case2) {
               cout << a << " is divisible by " << c << " only" <<
endl;
          } else {
               cout << a << " " << "is not divisible by both" << "
" << b << " " << "and" << " " << c;

          }
     }

     return 0;
}
```