CSC 2000
Introduction to C++ Programming Language
Assignment 03

50 points

Due 02/17/2020 (11:45 A.M.)

Assignment Objectives

- Learn how to use predefined functions in a program
- Learn how to generate a random number.
- Discover how to use manipulators in a program to format output
- Become familiar with file input and output
- Learn about repetition (looping) control structures
- Examine break and continue statements
- Discover how to form and use nested control structures

Answer questions 1 to 7 on a word file; write a program for each of Q.8 - Q.11.
All assignments must be submitted by the Canvas. **No email or hard copy** is accepted. You must follow the following format:

a. For non-programming questions, use a word file to type your answers. Don't use the text box on the Canvas to answer the questions or to write comments, we will not read it.
b. State your answer clearly.
c. For programming questions, include only the source file for each problem.
d. Submit your file to the Canvas. You must submit your assignment on time; otherwise, you will receive zero. In addition, you cannot submit your file more than one time.
e. There will be several folders on the Canvas. You need to upload your file(s) using the correct folder on the Canvas.
f. Name each file: "Assignment Number(Question number(s))".
g. To upload your file(s):
    - In Course Navigation, click the Assignments link.
    - Click the title of the assignment.
    - Click the **Submit** Assignment button.
    - Add **File**. ...
    - Add Another **File**. ...
    - **Submit** Assignment. ...
    - View **Submission**.

It is your responsibility to make sure that each file is uploaded correctly. If you uploaded a wrong file, you receive zero; files will not be accepted after due date even if you have a prove that the file is created before the due date.

Make sure you review the Cheating & Plagiarism policy on Canvas.

1. (3 points)

What is the output of the following program?

```
#include <iostream>
#include <cmath>
#include <string>
#include <iomanip>

using namespace std;

int main()
{
    double first, second;
    int temp;
    string message;

    first = 2.5;
    second = 4.0;

    cout << fixed << showpoint << setprecision(2);

    cout << (pow(first, second)) << endl;
    cout << (pow(second, first)) << endl;

    temp = static_cast<int>(pow(second, 1.5));

    cout << temp << endl;

    cout << sqrt(56.25) << endl;
    cout << static_cast<int>(sqrt(pow(first, temp))) << endl;

    message = "Predefined functions simplify programming code!";

    cout << "Length of message = "
         << message.length() << endl;
    return 0;
}
```

2. (6 points)

How many times will each of the following loops execute? What is the output in each case?

a.
```
x = 5;   y = 50;
do
    x = x + 10;
while (x < y);
cout << x << " " << y << endl;
```

b.
```
x = 5;   y = 80;
do
    x = x * 2;
while (x < y);
cout << x << " " << y << endl;
```

c.
```
x = 5;   y = 20;
do
    x = x + 2;
while (x >= y);
cout << x << " " << y << endl;
```

d.
```
x = 5;   y = 35;
while (x < y)
    x = x + 10;
cout << x << " " << y << endl;
```

e.
```
x = 5;   y = 30;
while (x <= y)
    x = x * 2;
cout << x << " " << y << endl;
```

f.
```
x = 5;   y = 30;
while (x > y)
    x = x + 2;
cout << x << " " << y << endl;
```

3. (3 points)

Rewrite the following as a **for** loop:

```
int i = 0, value = 0;

while (i <= 20)
{
    if (i % 2 == 0 && i <= 10)
        value = value + i * i;
    else if (i % 2 == 0 && i > 10)
        value = value + i;
    else
        value = value - i;
    i = i + 1;
}

cout << "value = " << value << endl;
```

What is the output of this loop?

4. (6 points)

Given the following program segment:

```
int limit = 4;
int first = 5;
int j;
for (j = 1; j <= limit; j++)
{
    cout << first * j << endl;
    first = first + (j - 1);
}
cout << endl;
```

write a **while** loop and a **do...while** loop that have the same output.

5. (2 points)

What is the output of the following code?

```
int num = 12;

while (num >= 0)
{
     if (num % 5 == 0)
          break;

     cout << num << " ";
     num = num - 2;
}

cout << endl;
```

6. (2 points)

What is the output of the following code?

```
int num = 12;

while (num >= 0)
{
     if (num % 5 == 0)
     {
          num++;
          continue;
     }

     cout << num << " ";
     num = num - 2;
}
cout << endl;
```

7. (3 points)

To learn how nested `for` loops work, do a walk-through of the following program segments and determine, in each case, the exact output.

a.
```
int i, j;

for (i = 1; i <= 5; i++)
{
    for (j = 1; j <= 5; j++)
        cout << setw(3) << i;
    cout << endl;
}
```

b.
```
int i, j;
for (i = 1; i <= 5; i++)
{
    for (j = (i + 1); j <= 5; j++)
        cout << setw(5) << j;
    cout << endl;
}
```

c.
```
int i, j;
for (i = 1; i <= 5; i++)
{
    for (j = 1; j <= i; j++)
        cout << setw(3) << j;
    cout << endl;
}
```

Programming Questions

8. (6 points)

Three employees in a company are up for a special pay increase. You are given a file, `Data.txt`, with the following data:

```
Miller Andrew 65789.87 5
Green Sheila 75892.56 6
Sethi Amit 74900.50 6.1
```

Each input line consists of an employee's last name, first name, current salary, and percent pay increase. For example, in the first input line, the last name of the employee is `Miller`, the first name is `Andrew`, the current salary is `65789.87`, and the pay increase is `5%`. Write a program that reads data from the specified file and stores the output in the file `Output.dat`. For each employee, the data must be output in the following form: `firstName lastName updatedSalary`. Format the output of decimal numbers to two decimal places.

9. (8 points)

Write a program that generates a random number between 1 and 100 and asks the user to guess what the number is. If the user's guess is higher than the random number, the program should display "Too high, try again." If the user's guess is lower than the random number, the program should display "Too low, try again." The program should use a loop that repeats until the user correctly guesses the random number.

10. (6 points)

Download Random.txt file from Canvas, in the Assignment 03 folder. The Random.txt file contains a long list of random numbers. Copy the file to your hard drive and then write a program that opens the file, reads all the numbers from the file, and calculates the following:
A) The number of numbers in the file
B) The sum of all the numbers in the file (a running total)
C) The average of all the numbers in the file
The program should display the number of numbers found in the file, the sum of the numbers, and the average of the numbers.

11. (5 points)

(*Math: combinations*) Write a program that displays all possible combinations for picking two numbers from integers 1 to 7. Also, display the total number of all combinations.

```
1 2
1 3
...
...

The total number of all combinations is 21
```