

CSE-278: Introduction to Systems Programming

Lab #2: C++ File I/O

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Part 1: File I/O

Consider the following incomplete C++ program:

```
#include <iostream>
int main()
{
    .
    .
    .
}
```

a. Write a statement that includes the header files *fstream*, *string* and *iomanip* in this program.

ANS:

```
#include <fstream>
#include <string>
#include <iomanip>
```

b. Write statements that declare **inFile** to be an *ifstream* variable and **outFile** to be an *ofstream* variable.

ANS:

```
ifstream inFile;
ofstream outFile;
```

c. The program will read data from the file **inData.txt** and write output to the file **outData.txt**. Write statements to open both these files, associate *inFile* *with* *inData.txt* and associate *outFile* *with* *outData.txt*

ANS:

```
inFile.open("./inData.txt");
outFile.open("./outData.txt");
outFile << "output" << endl;
```

d. Suppose that the file **inData.txt** contains the following data:

```
3 4 5
15.6
"Mark" "Taylor" 28
18500 3.5
B
```

The numbers in the *first line* represent the Side A, Side B and Side C of a Triangle. The number in the *second line* represents the radius of a circle (Assume that $\pi = 3.1416$). The *third line* contains the first name, last name, and the age of a person. The first number in the *fourth line* is the savings account balance at the beginning of the month and the second number is the interest rate per year. The *fifth line* contains an uppercase letter between B and Z (inclusive). Write statements so that after the program executes, the contents of the **outData.txt** are shown as below. If necessary, declare additional variables. Your statements should be general enough so that if the content of the input file changes and the program is run again (without editing and recompiling), it outputs the appropriate results.

Triangle:

Side A= 3, Side B = 4, Side C = 5, area = 6, perimeter = 12

Circle:

Radius = 15.60, area = 764.54, circumference = 98.02

Name: Mark Taylor, age: 28

Beginning balance = \$18500.00, interest rate = 3.50

Balance at the end of the month = \$18553.96

The character that comes **after** B in the ASCII set is C

e. Write statements that close the input and output files.

ANS:

f. Write a complete C++ program that tests the statements in parts a through e.

```
/* Copyright 2020 William Mechler
 * File: main.cpp
 * Author: willm
 * Created on June 9, 2020, 4:00 PM
 */

#include <cstdlib>
#include <iostream>
#include <fstream>
#include <string>
```

```
#include <vector>
#include <cmath>
#include <iomanip>

using namespace std;

string triangle(string input);
string circle(string input);
string name(string input);
string account(string input);
string letter(string input);
int main(int argc, char** argv) {
    ifstream inFile;
    ofstream outFile;
    vector<string> input;

    string temp = "";
    inFile.open("./inData.txt");

    outFile.open("./outData.txt");

    while (getline(inFile, temp)) {
        input.push_back(temp);
    }
    outFile << triangle(input[0]) << "\n";
    outFile << circle(input[1]) << "\n";
    outFile << name(input[2]) << "\n";
    outFile << account(input[3]) << "\n";
    outFile << letter(input[4]) << "\n";
    outFile.close();
}
string triangle(string input) {
    int sideA = stoi(input.substr(0, 2));
    int sideB = stoi(input.substr(2, 2));
    int sideC = stoi(input.substr(4, 2));
    int per = (sideA + sideB + sideC);
    float s = ((sideA + sideB + sideC) / 2);
    float area = sqrt(s*(s-sideA)*(s-sideB)*(s-sideC));
    string temp1 = "Side A =" + to_string(sideA) + ", " + "Side B =";
    string temp2 = to_string(sideB) + ", " + "Side C =" + to_string(sideC) +
    ", ";
    string temp3 = "area =" + to_string(area) + ", " + "perimeter =";
    string temp = temp1 + temp2 + temp3 + to_string(per);
    return temp;
}
```

```
string circle(string input) {
    float radius = stof(input);
    float pie = 3.14159;
    float area = pie * pow(radius, 2);
    float cir = 2 * (pie * radius);
    string temp1 = "Radius = " + to_string(radius) + ", " + "area = ";
    string temp2 = to_string(area) + ", " + "circumference = " +
to_string(cir);
    string temp = (temp1 + temp2);
    return temp;
}
string name(string input) {
    string fn = input.substr(3, 4);
    string ln = input.substr(14, 6);
    string age = input.substr(25, 5);
    string temp = "Name: " + fn + " " + ln + ", age: " + age;
    return temp;
}
string account(string input) {
    float bal = stof(input.substr(0, 5));
    float rate = stof(input.substr(6, 4));
    float newbal = (bal*(1+((rate/100)/12)));
    string temp1 = "Beginning balance =$" + to_string(bal) + ", interest rate
=";
    string temp2 =to_string(rate) + "\n";
    string temp3 ="Balance at the end of the month = $" +
to_string(newbal);
    string temp = (temp1 + temp2 + temp3);
    return temp;
}
string letter(string input) {
    char let = static_cast<char>(input.at(0));
    string str(1, let);
    int val = static_cast<int>(let);
    char nextLet = static_cast<char>(val+1);
    string temp1 = "The character that comes after " + str;
    string temp = " in the ASCII set is " + nextLet;
    string temp2 = temp1 + temp;
    return temp2;
}
```

Hints for Part 1:

- You should include the math header file and call appropriate routine
- You should calculate the area of Triangle using *Heron's* formula, defined as follows:

$s = (a+b+c)/2$ where a , b and c are the side lengths of the triangle

$area = \sqrt{(s*(s-a)*(s-b)*(s-c))}$ [square root over all the terms]

- Financial compound interest computed as follows: $F = P(1 + i)^n$ Where F is the future value of money P is the present value of money i is the interest rate in percentage (i.e., rate /100, also have to divide by 12 to make monthly interest rate), represent as decimal number n is the time period

- From char to int conversion and vice versa, you should use `<static_cast>`

PART 2: File I/O using file streams

When working on programs, you should be periodically saving and compiling your source code to ensure it compiles successfully! In general, when coding you should save and compile your C++ program after every 4 to 5 lines of change.

Exercise/Program requirement: Develop a C++ program that prints the last line of each paragraph in a given text file specified as command-line argument. Paragraphs are separated by one or more blank (i.e., empty) lines.

Procedure: Work on this exercise in the following manner:

1. Use the NetBeans project created in the earlier step (supplied starter code `PrintAllLines.cpp`)
2. Clean-up the starter code and ensure it compiles and runs successfully
3. In order gain practice working with generic I/O streams, add the following method that works with abstract streams to your starter code:

```
void printLastLine(std::istream& is, std::ostream& os)
```

The above method is the one that should process lines from input stream `is` (use `std::getline` to read lines) and print last line of each paragraph to output stream `os`.

4. Call the `printLastLine` method (from main) with a suitable `std::ifstream` to process data from a given text file specified as a command-line argument. Recollect that the file name will be in `argv[1]` in the main method. Use `std::cout` as the output stream.

Part #3: Submission

- No late assignments will be accepted!
- This work is to be done individually
- The submission file will be saved with the name **Lab2_yourMUID.pdf**
- The submission file will be saved with the name **Lab2Part1_yourMUID.cpp**
- The submission file will be saved with the name **Lab2Part2_yourMUID.cpp**

Due before: 11:59 PM (before Midnight) on Tuesday June 9, 2020

- Assignment is due Tuesday June 2, 2020 before Midnight
- On or before the due time, drop the *electronic copy* of your work in the *canvas*

Don't forget to Turn in the three files!

Lab2_yourMUID.pdf

Lab2Part1_yourMUID.cpp

Lab2Part2_yourMUID.cpp