C++ Worksheet Task_2

ASSESSMENT

WEIGHTAGE AND TYPE: 12.5%

YEAR: 2024-25

STUDENT NAME: SWOYAMRAJ SHRESTHA

STUDENT ID: 24030185

Question_1.1

Write a program that manages a simple student grade calculator with the following requirements.

Create a Student class that has:

1.Student name (string)
2.Three subject marks (integers)
3.A basic member function to calculate average

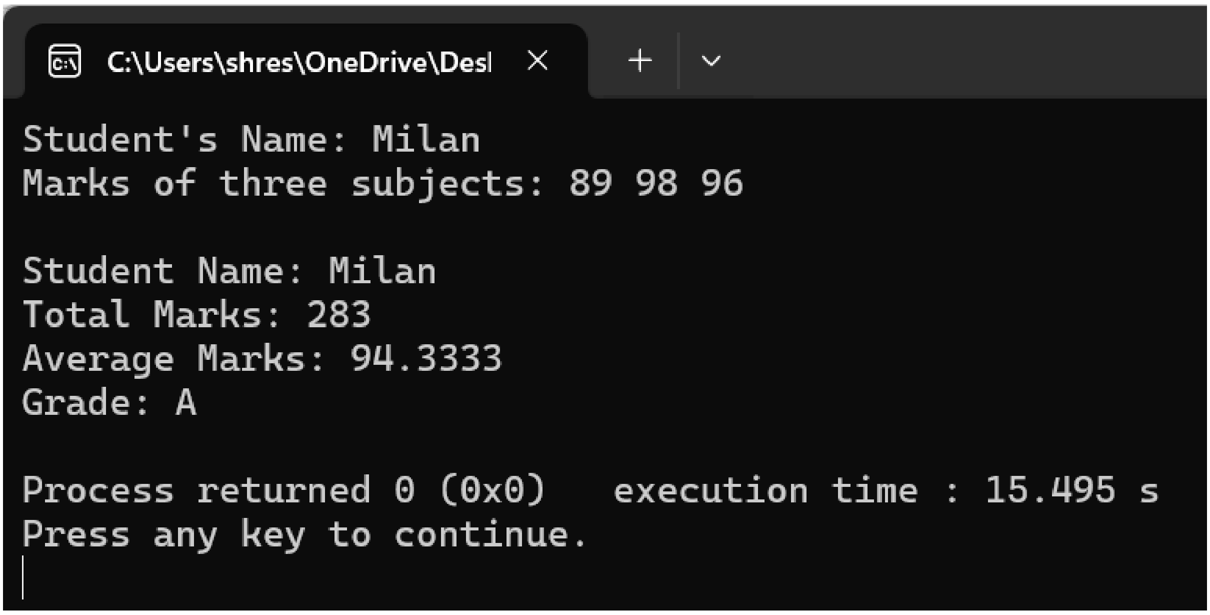
The program should:

1.Accept student details (name and marks) from user input
2.Calculate and display:
Total marks
Average marks
Grade (A for ≥90%, B for ≥80%, C for ≥70%, D for ≥60%, F for <60%)

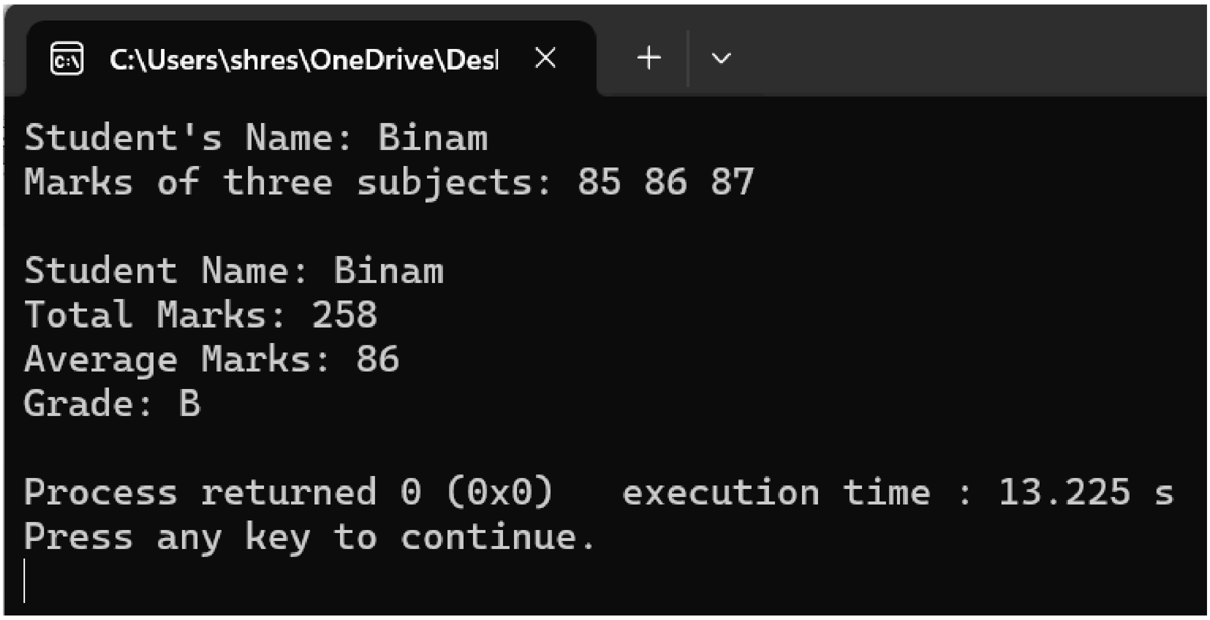
Display a message if any mark is below 0 or above 100

```
#include <iostream>
using namespace std;

class Student
{
  string name;
  int marks[3];

public:
    void stdDetails()
    {
      cout << "Student's Name: ";
      cin >> name;
      cout << "Marks of three subjects: ";
      for (int i = 0; i < 3; i++)
      {
        cin >> marks[i];
      if (marks[i] < 0 || marks[i] > 100) // uses marks input range between 0
and 100
        {
          cout << "Invalid! Marks should be in between 0 and 100." << endl;
          return;
        }
      }
    }
int calcTotalmarks()
  {
    return marks[0] + marks[1] + marks[2];
    }
    float calcAverage()
    {
        return calcTotalmarks() / 3.0;
    }
    char calcGrade()
    {
        float percentage = (calcTotalmarks() / 300.0) * 100;
        if (percentage >= 90) return 'A';
        else if (percentage >= 80) return 'B';
        else if (percentage >= 70) return 'C';
        else if (percentage >= 60) return 'D';
        else return 'F';
    }
    void displayResults()
        {
            int total = calcTotalmarks();
            float avg = calcAverage();
            char grade = calcGrade();
            cout << "\nStudent's Name: " << name << endl;
            cout << "Total Marks gained: " << total << endl;
            cout << "Average Marks: " << avg << endl;
            cout << "Grade: " << grade << endl;
        }
    };
int main()
{
    Student student;

    student.stdDetails();
    student.displayResults();

    return 0;
}
```

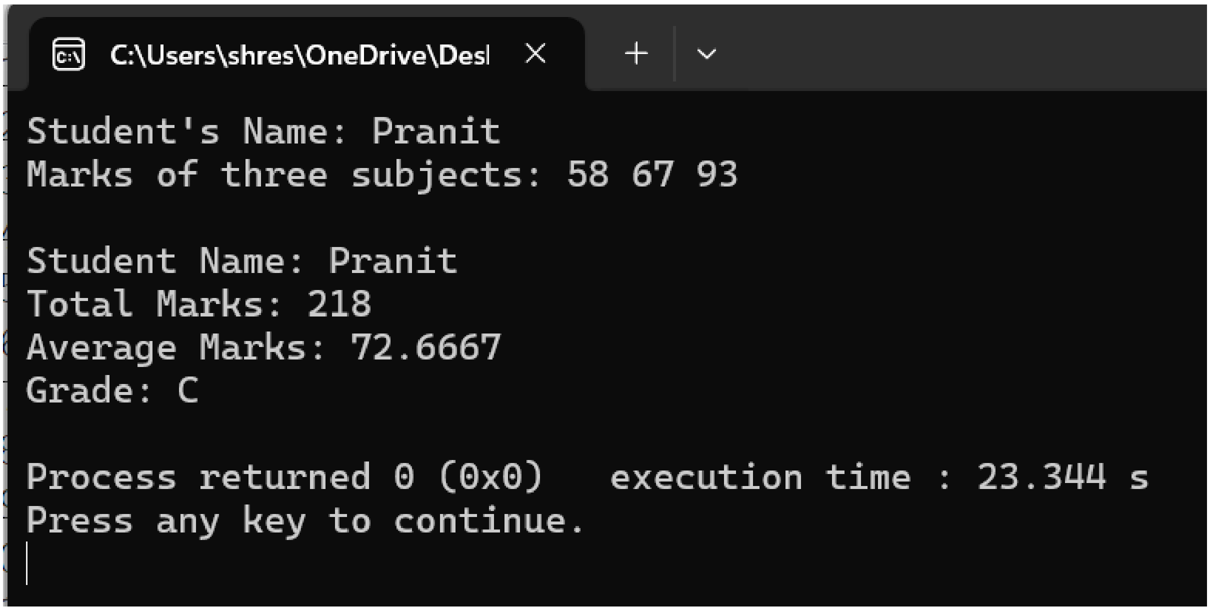
Output:



```
Student's Name: Milan
Marks of three subjects: 89 98 96

Student Name: Milan
Total Marks: 283
Average Marks: 94.3333
Grade: A

Process returned 0 (0x0)   execution time : 15.495 s
Press any key to continue.
```



```
Student's Name: Binam
Marks of three subjects: 85 86 87

Student Name: Binam
Total Marks: 258
Average Marks: 86
Grade: B

Process returned 0 (0x0)   execution time : 13.225 s
Press any key to continue.
```



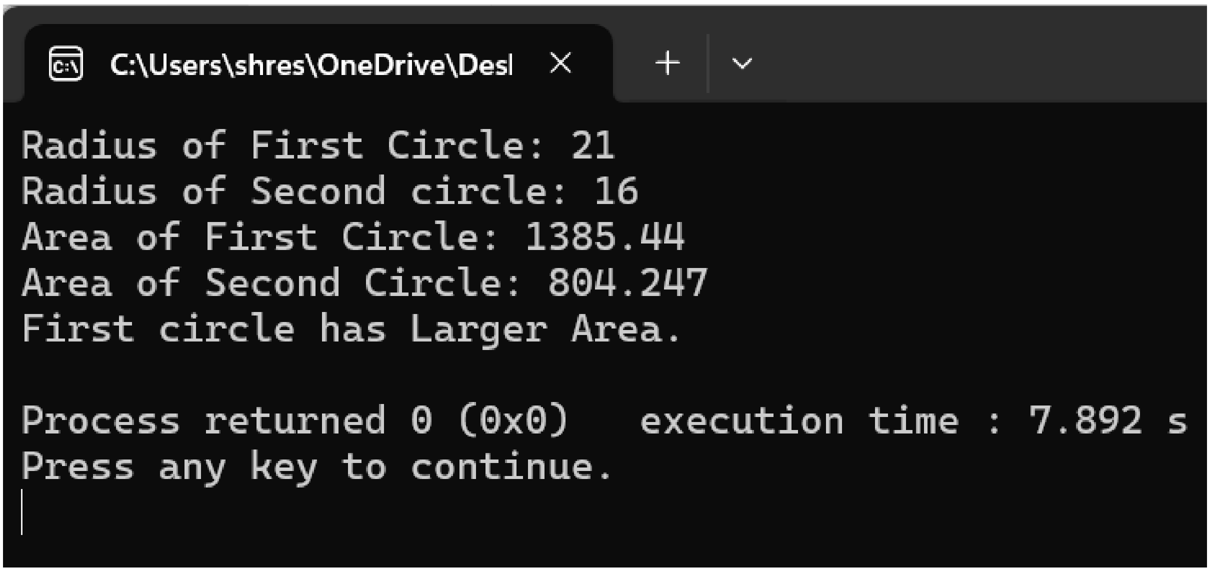
```
Student's Name: Pranit
Marks of three subjects: 58 67 93

Student Name: Pranit
Total Marks: 218
Average Marks: 72.6667
Grade: C

Process returned 0 (0x0)   execution time : 23.344 s
Press any key to continue.
```

Question_2.1

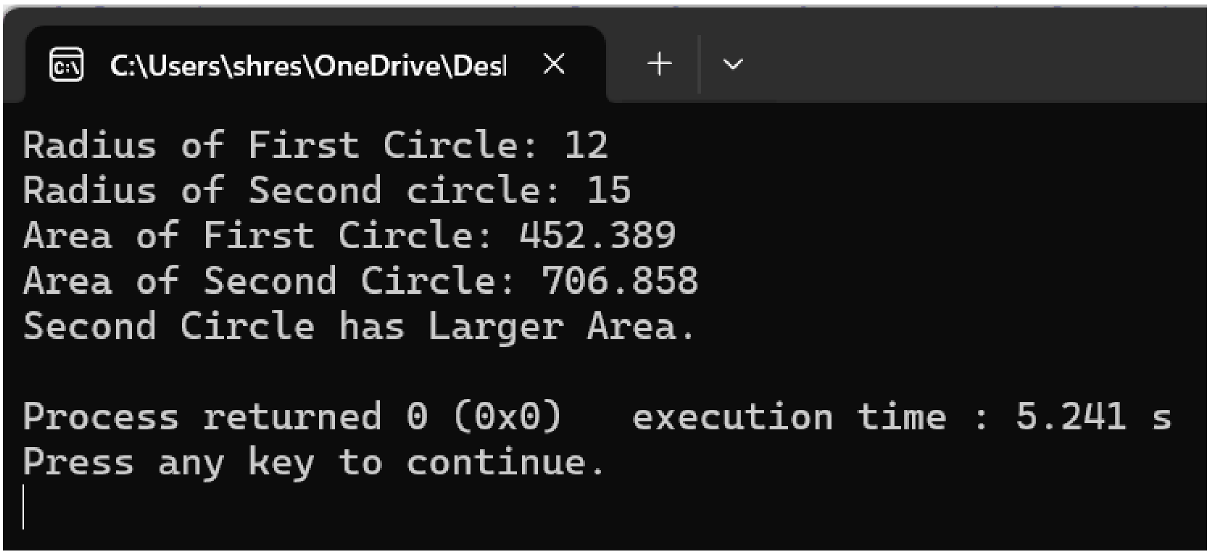
Write a program with a class Circle having:
*Private member: radius (float)
*A constructor to initialize radius
*A friend function compareTwoCircles that takes two Circle objects and prints which circle has the larger area.

```
#include <iostream>
using namespace std;

class Circle
{
private:
    float radius;

public:
    Circle(float r)
    {
        radius = r;
    }

    float calcArea() const
    {
        return 3.14159 * radius * radius;
    }

    void compare(const Circle& other) const //function for comparing two circles
    {
        float area1 = this-> calcArea();
        float area2 = other.calcArea();

        cout << "Area of First Circle: " << area1 << endl;
        cout << "Area of Second Circle: " << area2 << endl;

        if (area1 > area2)
        {
            cout << "First circle has Larger Area." << endl;
        }
        else if (area2 > area1)
        {
            cout << "Second Circle has Larger Area." << endl;
        }
        else
        {
            cout << "Both circle have the same area." << endl;
        }
    }
};
int main()
{
    float r1, r2;

    cout << "Radius of First Circle: ";
    cin >> r1;

    cout << "Radius of Second circle: ";
    cin >> r2;

    Circle circle1(r1), circle2(r2);

    circle1.compare(circle2); //comparing two circles

    return 0;
}
```

Output:



```
Radius of First Circle: 21
Radius of Second circle: 16
Area of First Circle: 1385.44
Area of Second Circle: 804.247
First circle has Larger Area.

Process returned 0 (0x0)   execution time : 7.892 s
Press any key to continue.
```



```
Radius of First Circle: 12
Radius of Second circle: 15
Area of First Circle: 452.389
Area of Second Circle: 706.858
Second Circle has Larger Area.

Process returned 0 (0x0)   execution time : 5.241 s
Press any key to continue.
```

Question_2.2

Create a program with these overloaded functions named findMax:

*One that finds maximum between two integers

*One that finds maximum between two floating-point numbers

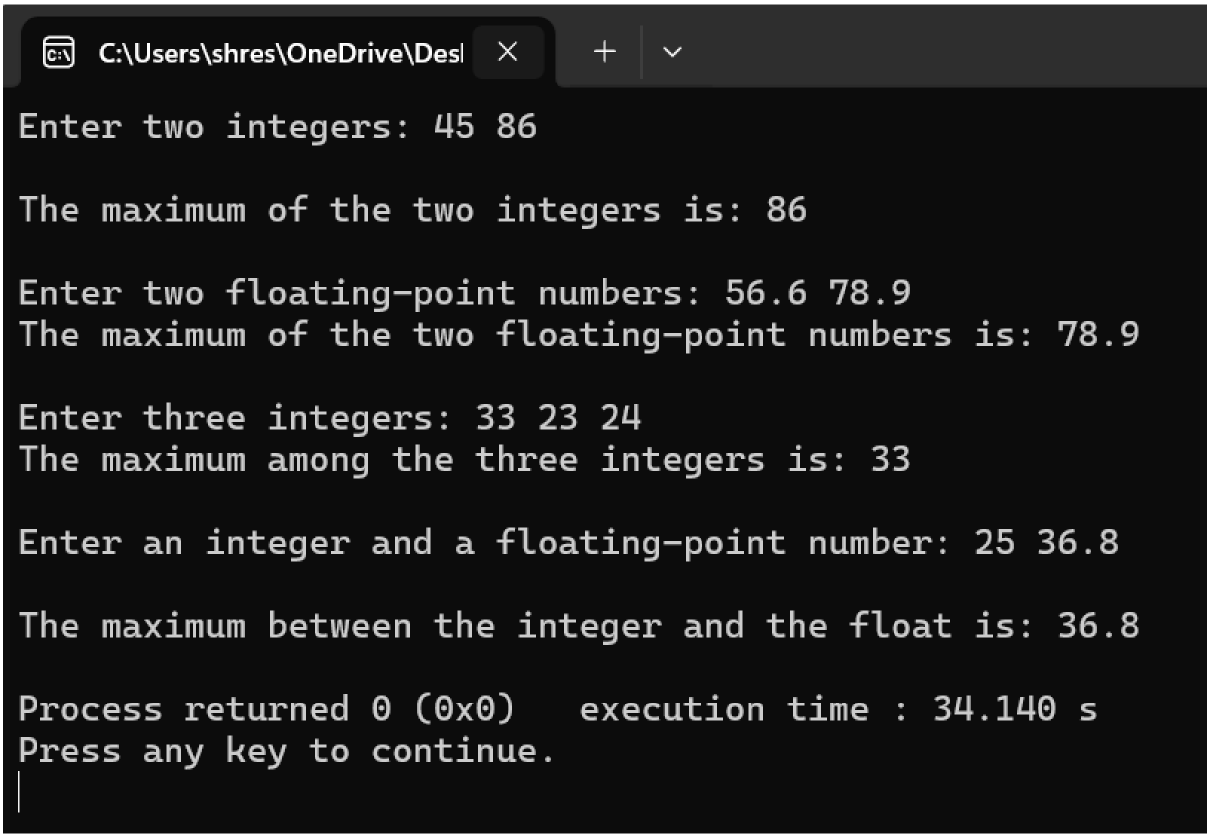
*One that finds maximum among three integers

-One that finds maximum between an integer and a float

```
#include <iostream>
using namespace std;

class MaxFinder
{
public:
   int findMax(int x, int y)
   {
      return (x > y) ? x : y; //finds maximum of two integers
   }
   float findMax(float x, float y) //finds maximum between two floating point numbers
   {
      return (x > y) ? x : y;
   }
      int findMax(int x, int y, int z) //finds maximum among three integers
   {
      if (x > y && x > z)//Comparing all
         {
            return x;
         }
```

```
        else if (y > x && y > z)
            {
                return y;
            }
        else
            {
                return z;
            }
    }
    float findMax(int x, float y) //finds maximum between an integer and floating-point number
    {
        return (x > y) ? x : y;
    }
};

int main()
{
    MaxFinder maxFinder;  //Creating an object of MaxFinder class
    int int1, int2, int3; //Declared variables to store user input
    float float1, float2;

    cout << "Enter two integers: ";
    cin >> int1 >> int2;
    cout << "The maximum of the two integers is: " << maxFinder.findMax(int1, int2) << endl;

    cout << "Enter two floating-point numbers: ";
    cin >> float1 >> float2;
    cout << "The maximum of the two floating-point numbers is: " << maxFinder.findMax(float1, float2) << endl;


    cout << "Enter three integers: ";
    cin >> int1 >> int2 >> int3;
    cout << "The maximum among the three integers is: " << maxFinder.findMax(int1, int2, int3) << endl;


    cout << "Enter an integer and a floating-point number: ";
    cin >> int1 >> float1;
    cout << "The maximum between the integer and the float is: " << maxFinder.findMax(int1, float1) << endl;


    return 0;
}
```

Output:



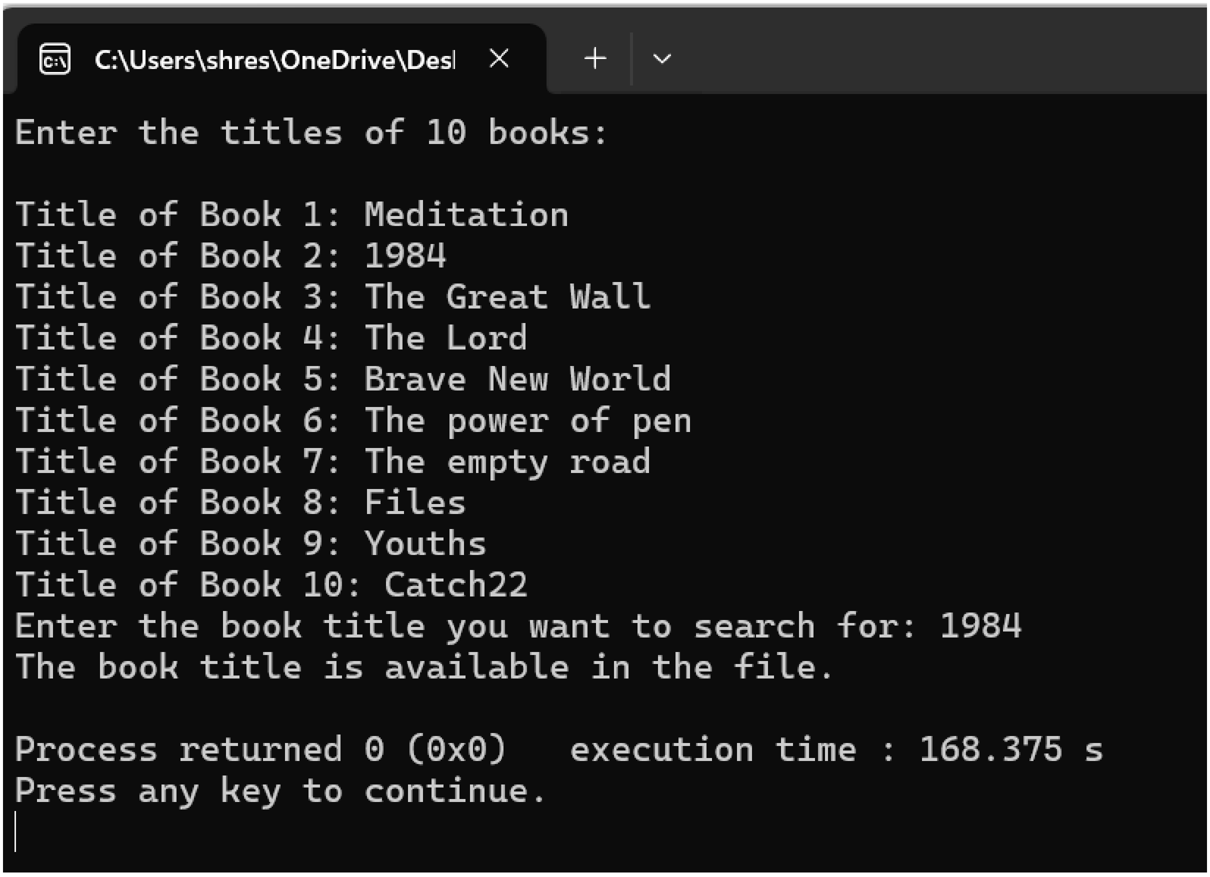
```
Enter two integers: 45 86

The maximum of the two integers is: 86

Enter two floating-point numbers: 56.6 78.9
The maximum of the two floating-point numbers is: 78.9

Enter three integers: 33 23 24
The maximum among the three integers is: 33

Enter an integer and a floating-point number: 25 36.8

The maximum between the integer and the float is: 36.8

Process returned 0 (0x0)   execution time : 34.140 s
Press any key to continue.
```

Question_3.1

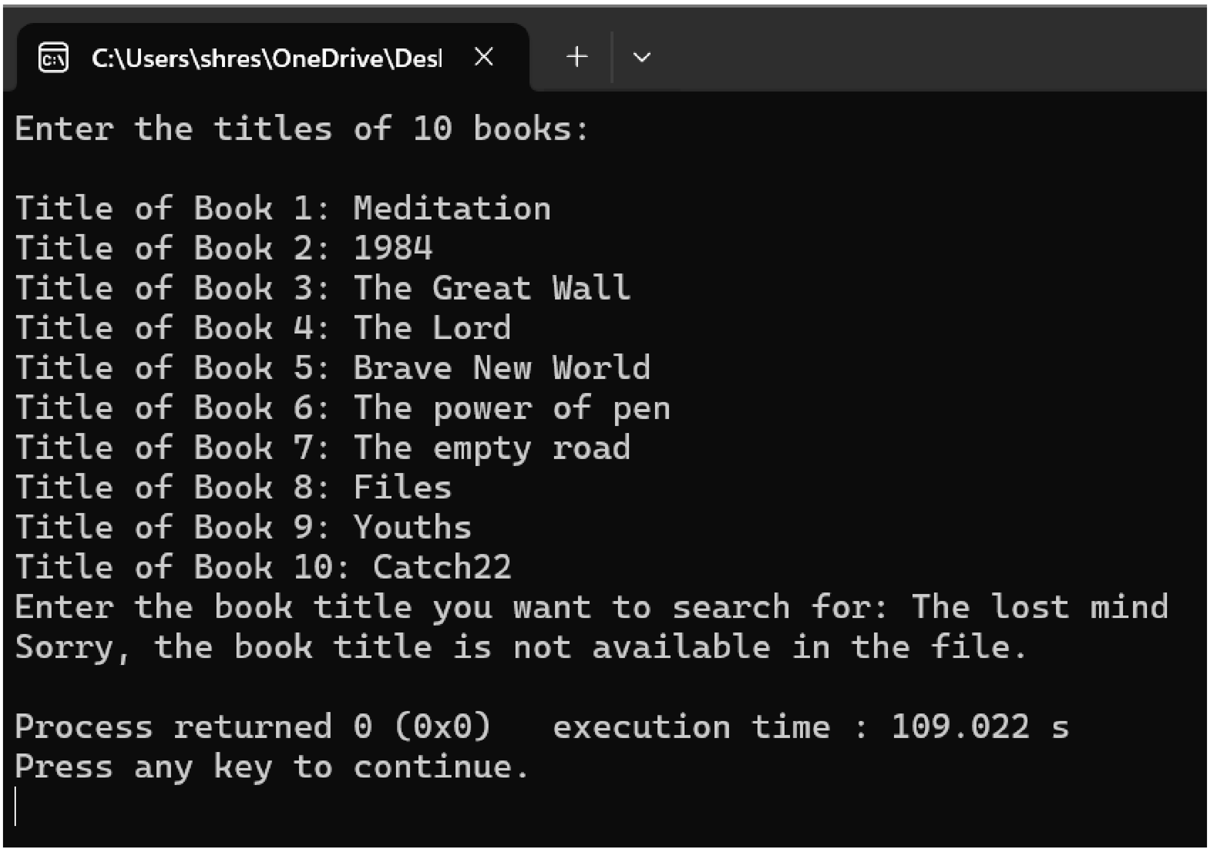
Write a program that reads the titles of 10 books (use an array of 150 characters) and writes them in a binary file selected by the user. The program should read a title and display a message to indicate if it is contained in the file or not.

```
#include <iostream>
#include <fstream>
#include <cstring>
using namespace std;

int main()
{
   char books[10][150];  //using array to store 10 book titles with each of 150
characters
   ofstream outputFile;
   outputFile.open("books.dat", ios::binary | ios::app);
   if (!outputFile)
      {
         cout << "Unable to open file for writing!" << endl;
         return 1;
      }

   cout << "Enter the titles of 10 books:" << endl;
   cin.ignore();
   for (int i = 0; i < 10; i++)
      {
         cout << "Title of Book " << i + 1 << ": ";
         cin.getline(books[i], 150);
         outputFile.write(books[i], sizeof(books[i]));
      }

   outputFile.close();  //closes file

   char searchTitle[150];
   cout << "Enter the book title you want to search for: ";
   cin.getline(searchTitle, 150);

   ifstream testFile("books.dat", ios::binary);
   if (!testFile)
   {
        ofstream createFile("books.dat", ios::binary);
        createFile.close();
    }
    testFile.close();

    ifstream inFile("books.dat", ios::binary); //binary file
    if (!inFile)
        {
            cout << "Error opening file for reading!" << endl;
            return 1;
        }
    bool isfound = false;
    char title[150];
    while (inFile.read(title, sizeof(title)))
    {
        if (strcmp(title, searchTitle) == 0)
        {
            isfound = true;
            break;
        }
    }
    if (isfound)
    {
            cout << "The book title is available in the file." << endl;
    }
    else
    {
            cout << "Sorry, the book title is not available in the file." << endl;
    }
    inFile.close();
    return 0;
}
```

Output:



```
Enter the titles of 10 books:

Title of Book 1: Meditation
Title of Book 2: 1984
Title of Book 3: The Great Wall
Title of Book 4: The Lord
Title of Book 5: Brave New World
Title of Book 6: The power of pen
Title of Book 7: The empty road
Title of Book 8: Files
Title of Book 9: Youths
Title of Book 10: Catch22
Enter the book title you want to search for: 1984
The book title is available in the file.

Process returned 0 (0x0)   execution time : 168.375 s
Press any key to continue.
```



```
Enter the titles of 10 books:

Title of Book 1: Meditation
Title of Book 2: 1984
Title of Book 3: The Great Wall
Title of Book 4: The Lord
Title of Book 5: Brave New World
Title of Book 6: The power of pen
Title of Book 7: The empty road
Title of Book 8: Files
Title of Book 9: Youths
Title of Book 10: Catch22
Enter the book title you want to search for: The lost mind
Sorry, the book title is not available in the file.

Process returned 0 (0x0)   execution time : 109.022 s
Press any key to continue.
```

Question_3.2

Create a program that:

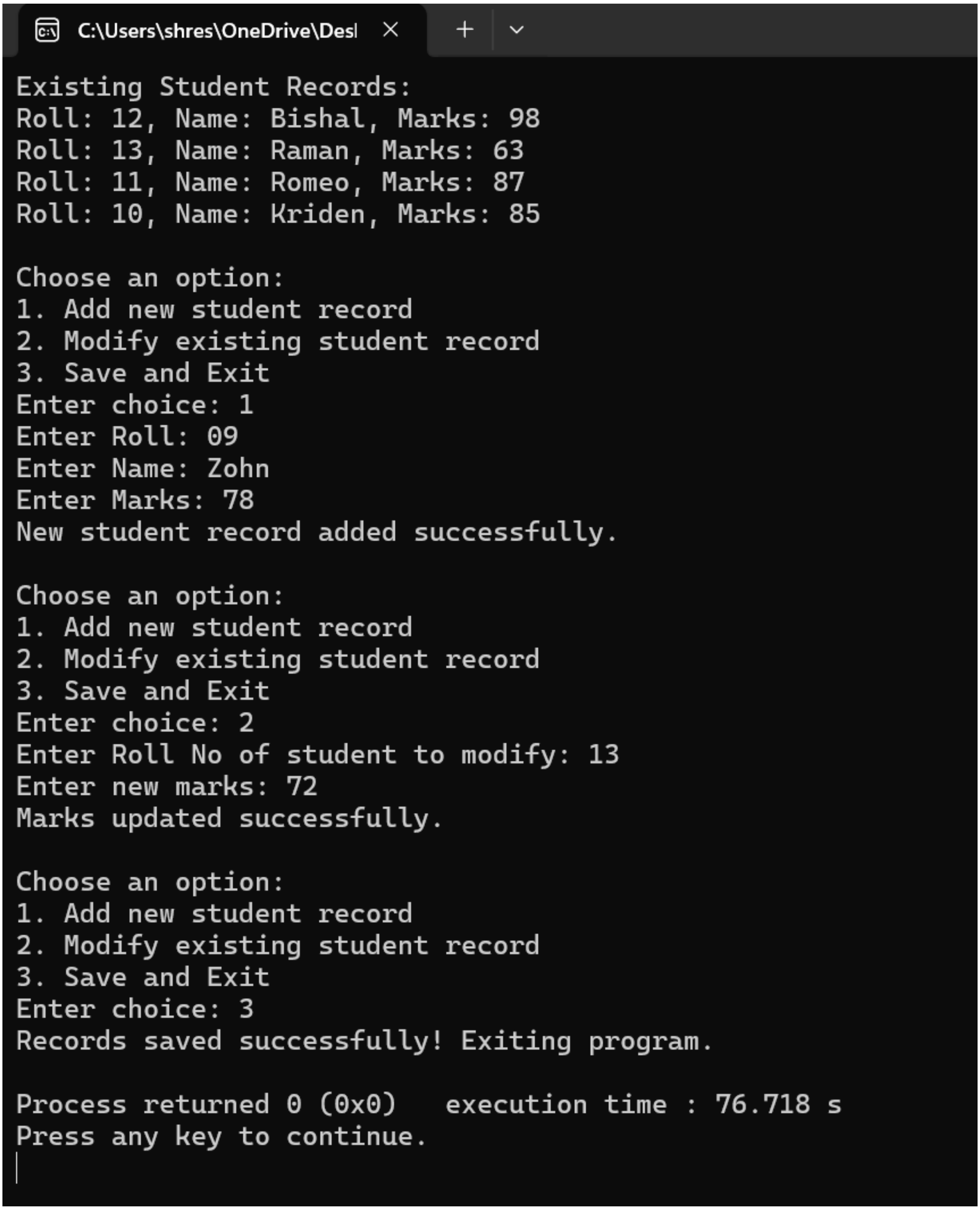
*Reads student records (roll, name, marks) from a text file
*Throws an exception if marks are not between 0 and 100
*Allows adding new records with proper validation
*Saves modified records back to file

```
#include <iostream>
#include <fstream>
#include <stdexcept>
#include <string>
#include <vector>
using namespace std;

struct Student
{
   int roll;
   string name;
   int marks;
};

void validateMarks(int marks)
{
   if (marks < 0 || marks > 100)
   {
      throw out_of_range("Marks should be between 0 and 100.");
   }
}
vector<Student> readRecords(string fileName)
{
   vector<Student> records;
   ifstream File(fileName);

   if (!File)
   {
      cout << "The file does not exist.\n";
      return records;
   }

   Student student;
```

```
    while (File >> student.roll >> student.name >> student.marks)
        {
            records.push_back(student);
        }

    File.close();
    return records;
}

void saveStdRecords(string fileName, vector<Student> records)
{
    ofstream File(fileName);

    if (!File)
    {
        cout << "Error opening file for writing!\n";
        return;
    }

    for (const auto& records : records)
    {
        File << records.roll << " " << records.name << " " << records.marks <<
endl;
    }
    File.close();
}

int main()
{
    string fileName = "Student's Record.txt";
    vector<Student> studentlist = readRecords(fileName);

    if (!studentlist.empty())
    {
        cout << "Existing Student Records:\n";
        for (const auto& student : studentlist)
        {
                cout << "Roll: " << student.roll << ", Name: " << student.name << ",
Marks: " << student.marks << endl;
        }
    }
    else
    {
```

```
    cout << "No records found.\n";
}
bool running = true;
while (running)
    {
        int userchoice;
        cout << "\nChoose an option:\n";
        cout << "1. Add new student record\n";
        cout << "2. Modify existing student record\n";
        cout << "3. Save and Exit\n";
        cout << "Enter choice: ";
        cin >> userchoice;

    if (userchoice == 1)
        {
            Student newStudent; // Option to add a new student
            cout << "Enter Roll: ";
            cin >> newStudent.roll;
            cin.ignore(); // To clear the buffer after taking integer input
            cout << "Enter Name: ";
            getline(cin, newStudent.name);
            cout << "Enter Marks: ";
            cin >> newStudent.marks;

            try
            {
                validateMarks(newStudent.marks);
                studentlist.push_back(newStudent);
                cout << "New student record added successfully.\n";
            }
    catch (const out_of_range& e)
    {
        cout << "Error: " << e.what() << endl;
    }
        }

    else if (userchoice == 2)
        {
            int rollNoToModify;
            cout << "Enter Roll No of student to modify: ";
            cin >> rollNoToModify;

            bool recfound = false;
        for (auto& student : studentlist)
          {
            if (student.roll == rollNoToModify)
              {
                recfound = true;
                cout << "Enter new marks: ";
                int newMarks;
                cin >> newMarks;

            try
              {
              validateMarks(newMarks);
              student.marks = newMarks;
              cout << "Marks updated successfully.\n";
              }
            catch (const out_of_range& e)
              {
                cout << "Error: " << e.what() << endl;
              }
            break;
              }
          }
            if (!recfound)
              {
                cout << "Student with Roll No " << rollNoToModify  << "
not found.\n";
              }
      }

    else if (userchoice == 3)
      {
        saveStdRecords(fileName, studentlist);
        cout << "Records saved successfully! Exiting program.\n";
        running = false;
      }

    else
      {
        cout << "Invalid choice. Please try again.\n";
      }
    }
  return 0;
}
```

Output:



```
Existing Student Records:
Roll: 12, Name: Bishal, Marks: 98
Roll: 13, Name: Raman, Marks: 63
Roll: 11, Name: Romeo, Marks: 87
Roll: 10, Name: Kriden, Marks: 85

Choose an option:
1. Add new student record
2. Modify existing student record
3. Save and Exit
Enter choice: 1
Enter Roll: 09
Enter Name: Zohn
Enter Marks: 78
New student record added successfully.

Choose an option:
1. Add new student record
2. Modify existing student record
3. Save and Exit
Enter choice: 2
Enter Roll No of student to modify: 13
Enter new marks: 72
Marks updated successfully.

Choose an option:
1. Add new student record
2. Modify existing student record
3. Save and Exit
Enter choice: 3
Records saved successfully! Exiting program.

Process returned 0 (0x0)   execution time : 76.718 s
Press any key to continue.
```