WORK SHEET 2

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Worksheet 2

Task 1: Basic student grading system prototype using classes and objects. [20 Marks]

Write a program that manages a simple student grade calculator with the following requirements. Create a `Student` class that has:

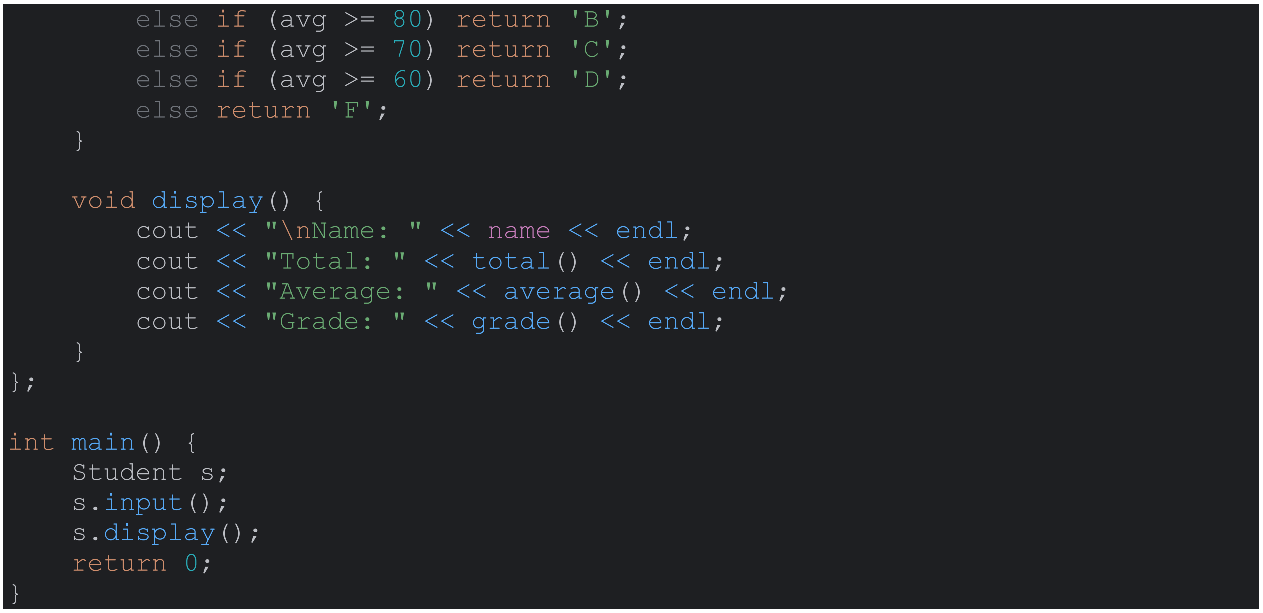
1. Student name (string)
2. Three subject marks (integers)
3. A basic member function to calculate average

The program should:

1. Accept student details (name and marks) from user input
2. Calculate and display:
    1. Total marks
    2. Average marks
    3. Grade (A for ≥90%, B for ≥80%, C for ≥70%, D for ≥60%, F for <60%)
3. Display a message if any mark is below 0 or above 100

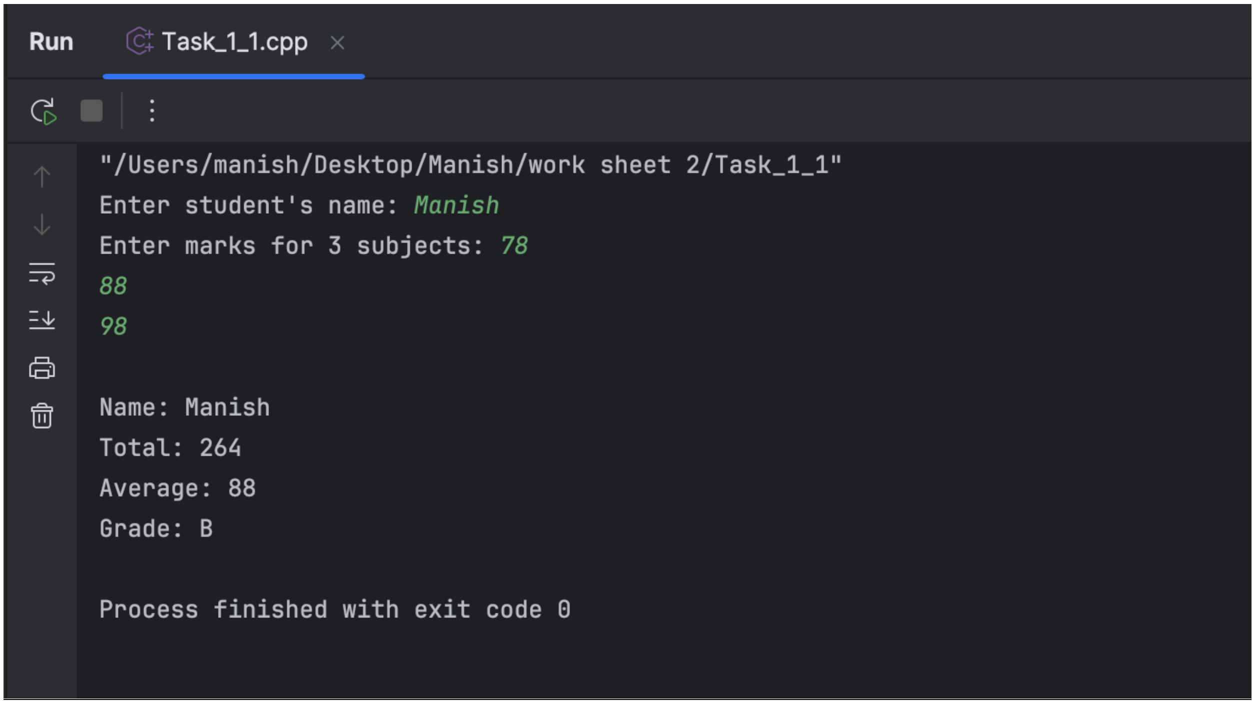
Source code for this:

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

class Student {
public:
    string name;
    int m1, m2, m3;

    void input() {
        cout << "Enter student's name: ";
        cin >> name;

        cout << "Enter marks for 3 subjects: ";
        cin >> m1 >> m2 >> m3;
    }

    int total() {
        return m1 + m2 + m3;
    }

    float average() {
        return total() / 3.0;
    }

    char grade() {
        float avg = average();
        if (avg >= 90) return 'A';
```



```
        else if (avg >= 80) return 'B';
        else if (avg >= 70) return 'C';
        else if (avg >= 60) return 'D';
        else return 'F';
    }

    void display() {
        cout << "\nName: " << name << endl;
        cout << "Total: " << total() << endl;
        cout << "Average: " << average() << endl;
        cout << "Grade: " << grade() << endl;
    }
};

int main() {
    Student s;
    s.input();
    s.display();
    return 0;
}
```

Output:



```
"/Users/manish/Desktop/Manish/work sheet 2/Task_1_1"
Enter student's name: Manish
Enter marks for 3 subjects: 78
88
98

Name: Manish
Total: 264
Average: 88
Grade: B

Process finished with exit code 0
```

Task 2: Programming assignments: All questions are mandatory

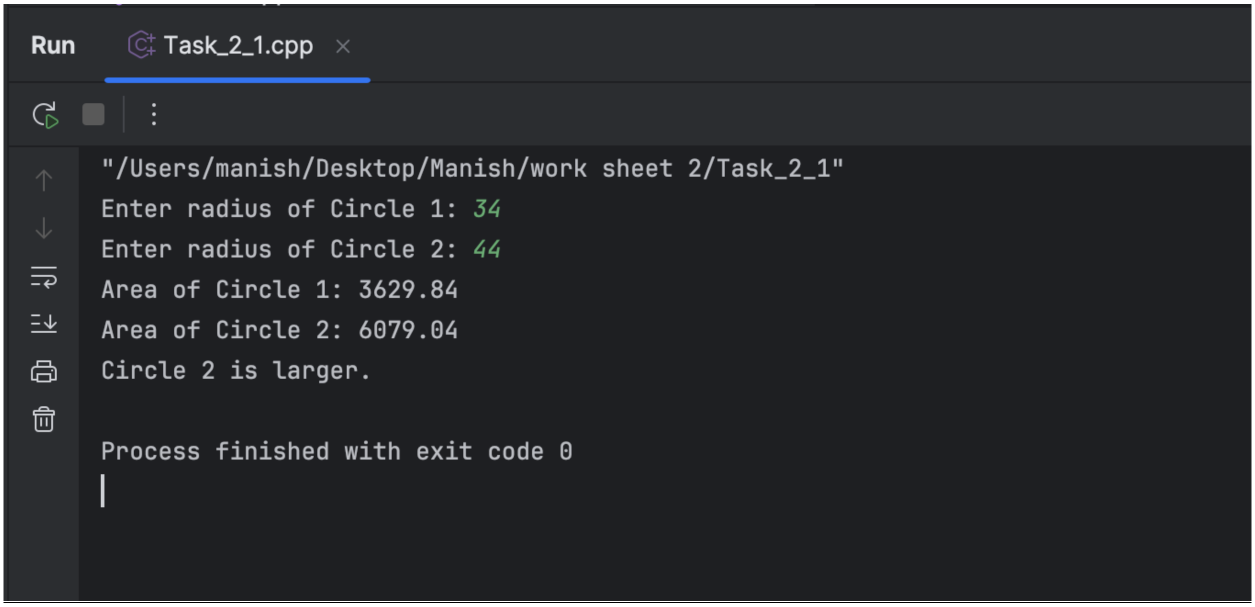
1. Write a program with a class `Circle` having:
    1. Private member: radius (float)
    2. A constructor to initialize radius

3. A friend function compareTwoCircles that takes two Circle objects and prints which circle has the larger area

Source code for this:

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

class Circle {
public:
    float radius;

    Circle(float r) {
        radius = r;
    }

    float area() {
        return 3.14 * radius * radius;
    }
};

void compare(Circle c1, Circle c2) {
    float a1 = c1.area();
    float a2 = c2.area();

    cout << "Area of Circle 1: " << a1 << endl;
    cout << "Area of Circle 2: " << a2 << endl;

    if (a1 > a2)
        cout << "Circle 1 is larger.\n";
    else if (a2 > a1)
        cout << "Circle 2 is larger.\n";
    else
        cout << "Both circles have the same area.\n";
}

int main() {
    float r1, r2;

    cout << "Enter radius of Circle 1: ";
    cin >> r1;

    cout << "Enter radius of Circle 2: ";
    cin >> r2;

    Circle c1(r1), c2(r2);
    compare(c1, c2);

    return 0;
}
```

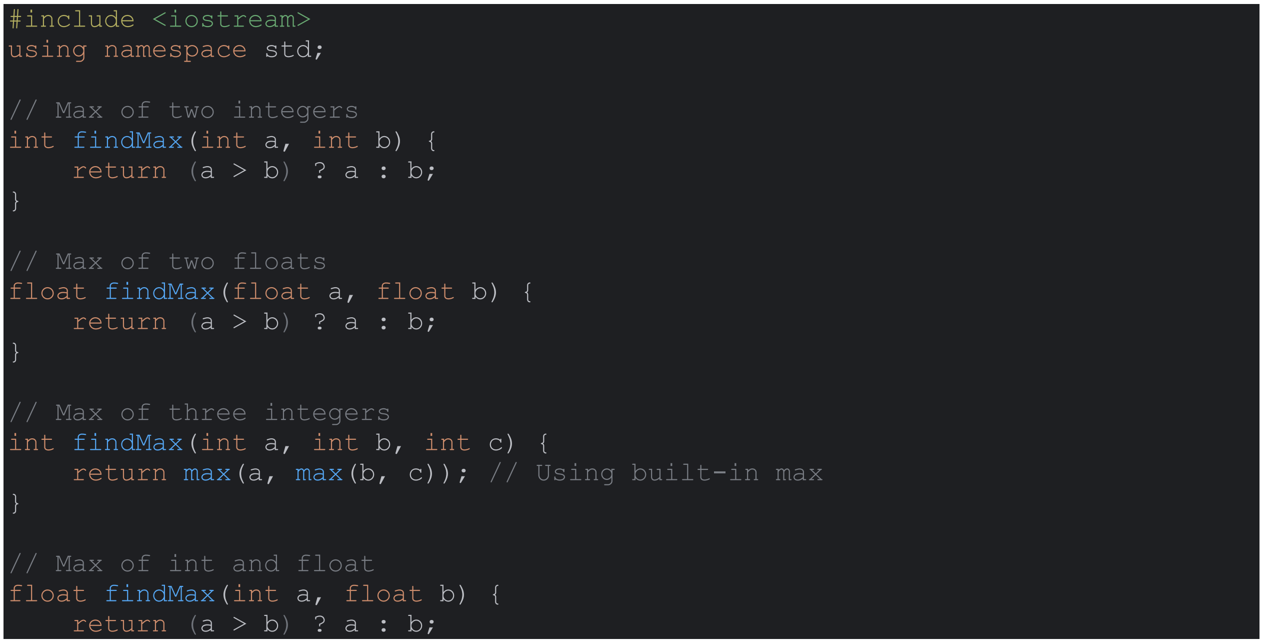
Output:



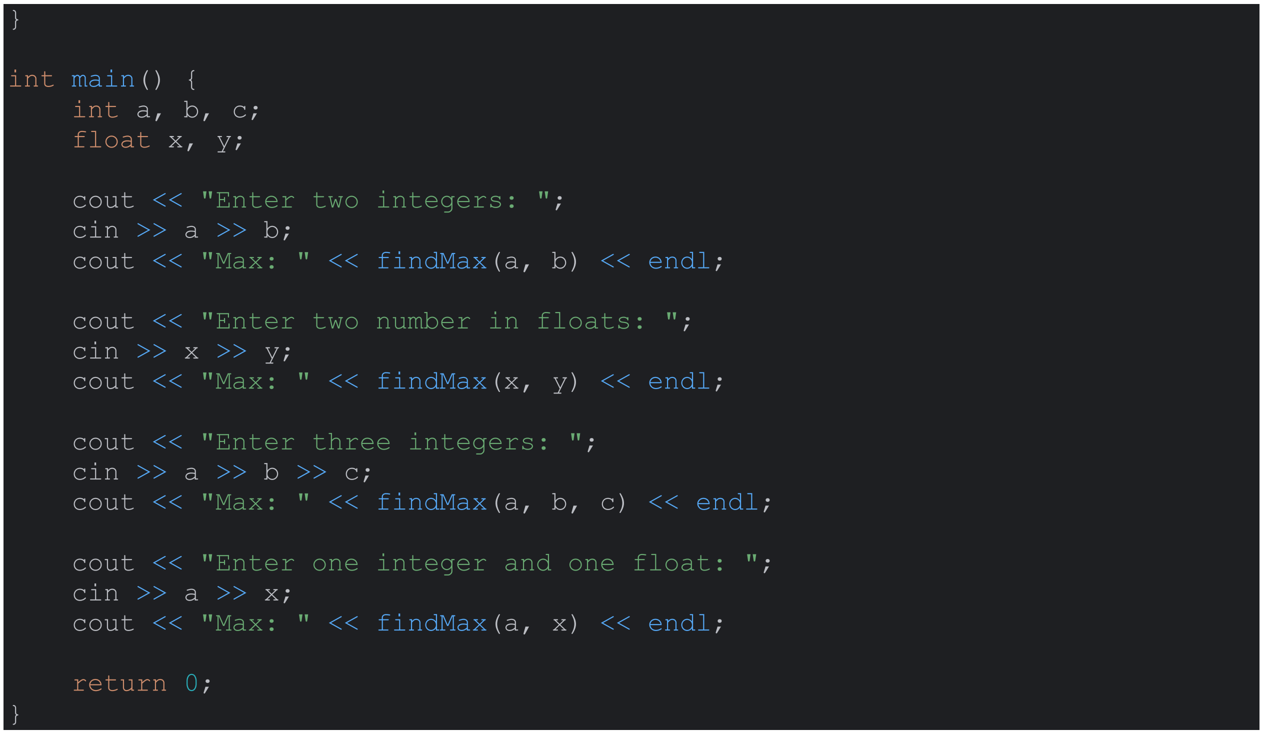
```
"/Users/manish/Desktop/Manish/work sheet 2/Task_2_1"
Enter radius of Circle 1: 34
Enter radius of Circle 2: 44
Area of Circle 1: 3629.84
Area of Circle 2: 6079.04
Circle 2 is larger.

Process finished with exit code 0
```

1. Create a program with these overloaded functions named `findMax`:
    1. One that finds maximum between two integers
    2. One that finds maximum between two floating-point numbers
    3. One that finds maximum among three integers
    4. One that finds maximum between an integer and a float

Source code for this:

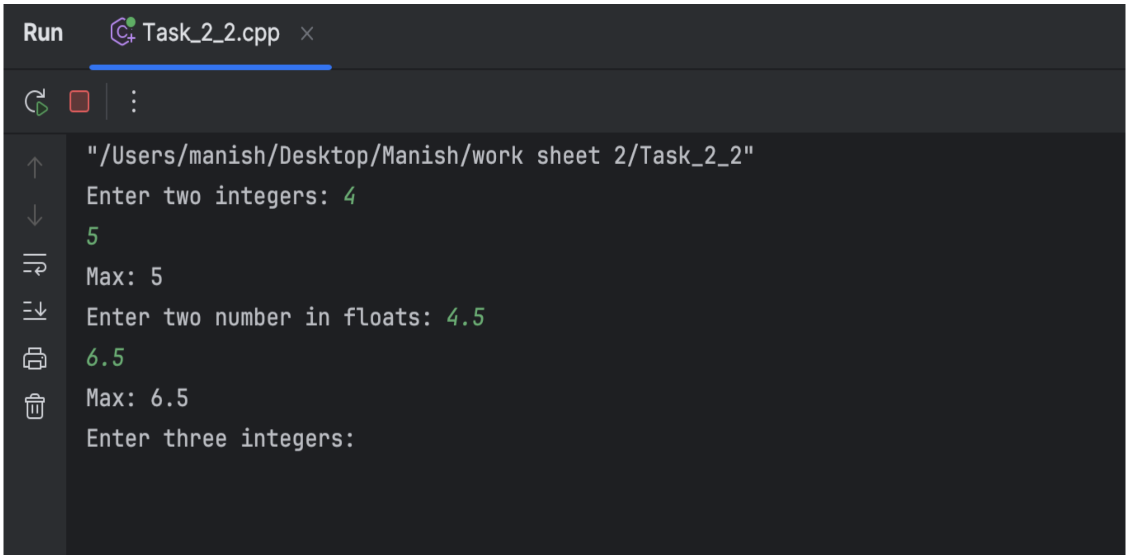


```cpp
#include <iostream>
using namespace std;

// Max of two integers
int findMax(int a, int b) {
    return (a > b) ? a : b;
}

// Max of two floats
float findMax(float a, float b) {
    return (a > b) ? a : b;
}

// Max of three integers
int findMax(int a, int b, int c) {
    return max(a, max(b, c)); // Using built-in max
}

// Max of int and float
float findMax(int a, float b) {
    return (a > b) ? a : b;
```



```
}

int main() {
    int a, b, c;
    float x, y;

    cout << "Enter two integers: ";
    cin >> a >> b;
    cout << "Max: " << findMax(a, b) << endl;

    cout << "Enter two number in floats: ";
    cin >> x >> y;
    cout << "Max: " << findMax(x, y) << endl;

    cout << "Enter three integers: ";
    cin >> a >> b >> c;
    cout << "Max: " << findMax(a, b, c) << endl;

    cout << "Enter one integer and one float: ";
    cin >> a >> x;
    cout << "Max: " << findMax(a, x) << endl;

    return 0;
}
```

<u>Output:</u>

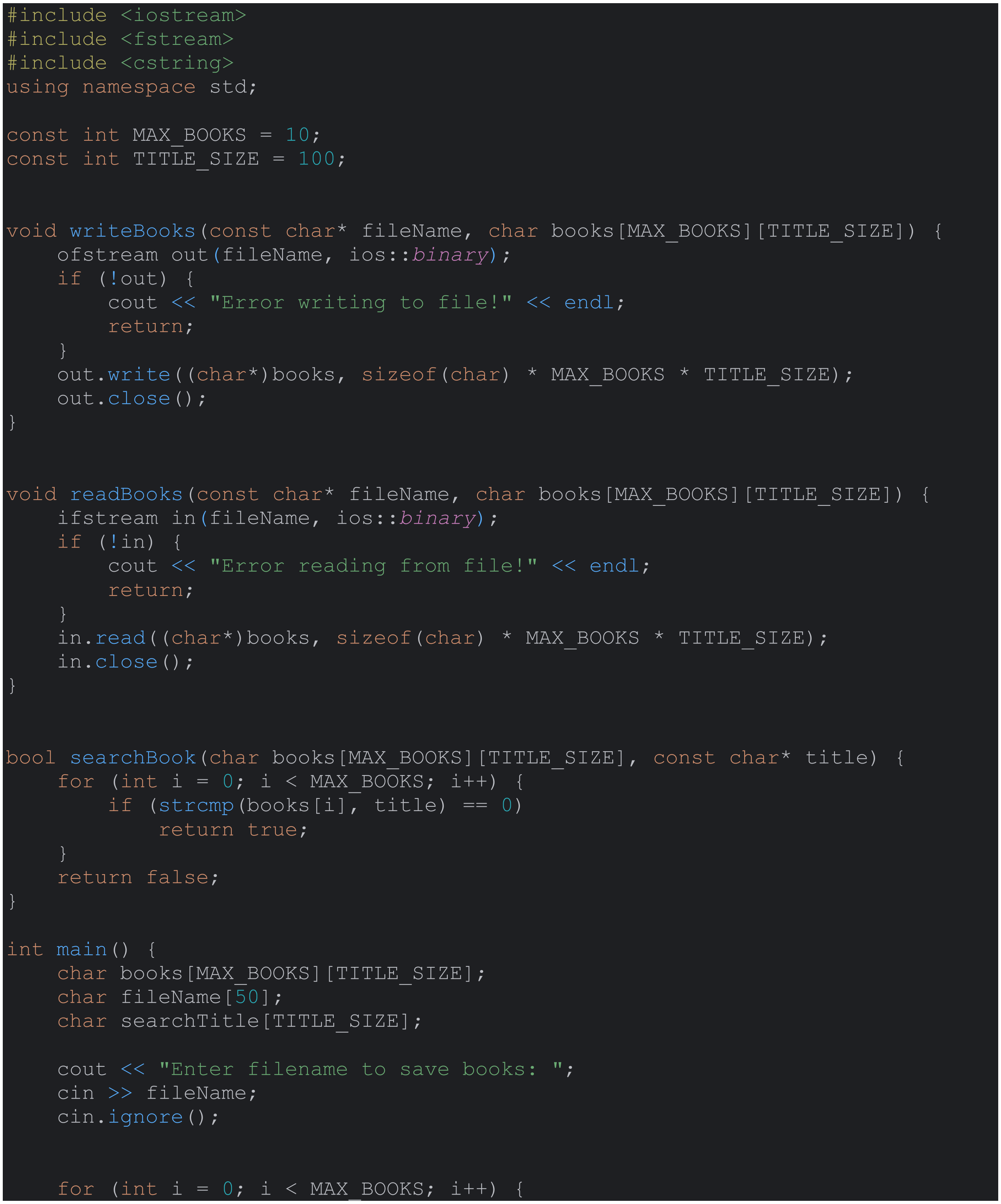


```
"/Users/manish/Desktop/Manish/work sheet 2/Task_2_2"
Enter two integers: 4
5
Max: 5
Enter two number in floats: 4.5
6.5
Max: 6.5
Enter three integers:
```

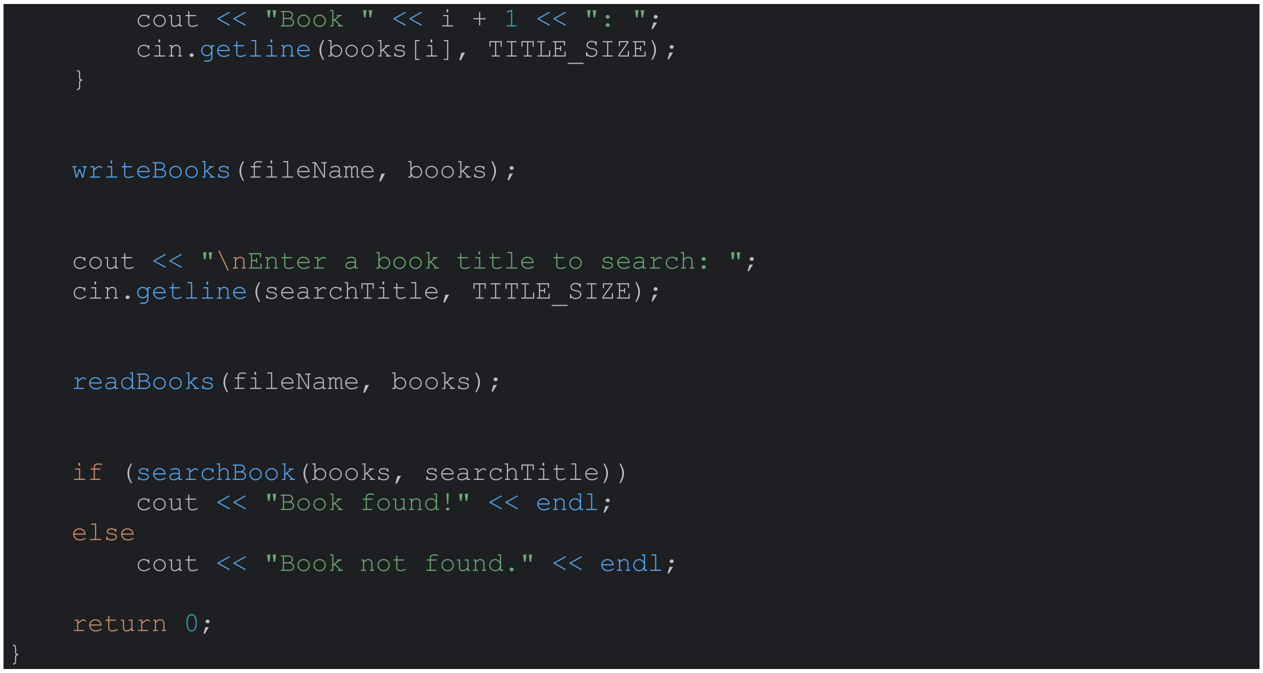
<u>Task 3: Basics of File Handling</u>

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.

Source code for this:

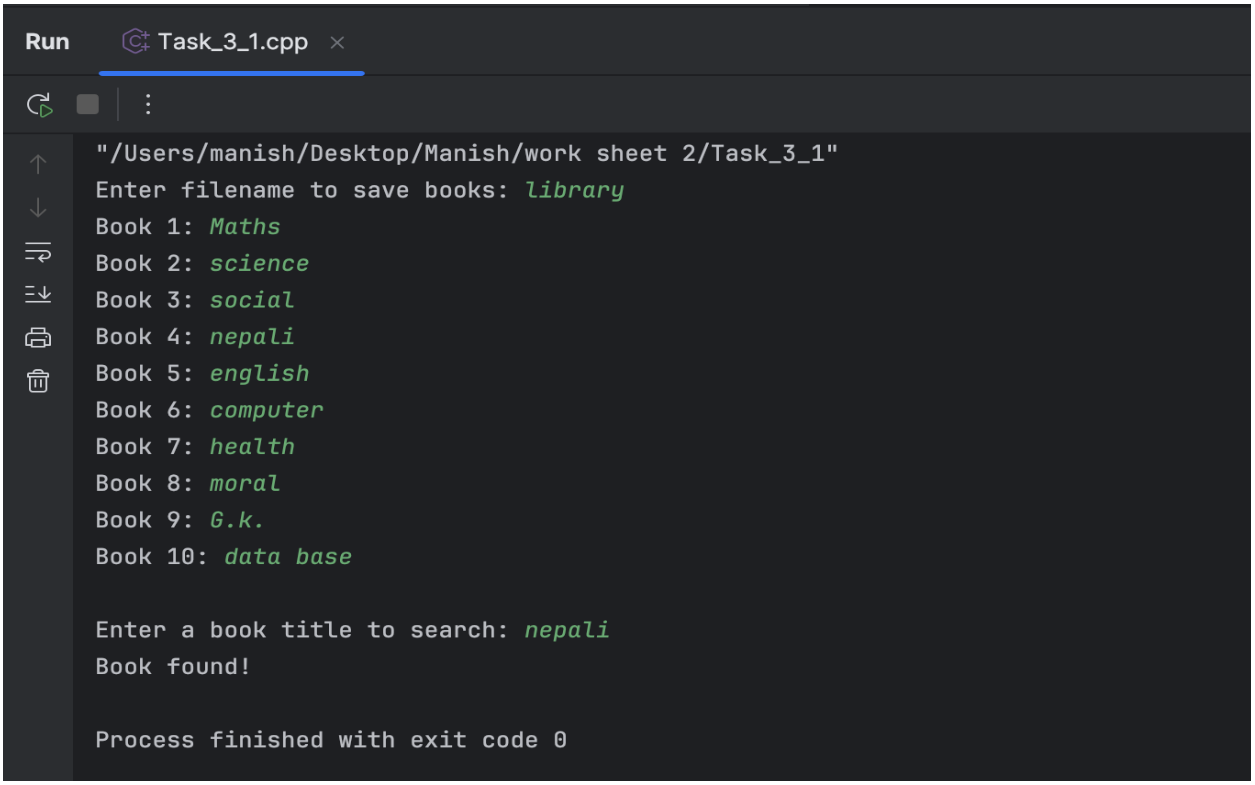


```
#include <iostream>
#include <fstream>
#include <cstring>
using namespace std;

const int MAX_BOOKS = 10;
const int TITLE_SIZE = 100;


void writeBooks(const char* fileName, char books[MAX_BOOKS][TITLE_SIZE]) {
    ofstream out(fileName, ios::binary);
    if (!out) {
        cout << "Error writing to file!" << endl;
        return;
    }
    out.write((char*)books, sizeof(char) * MAX_BOOKS * TITLE_SIZE);
    out.close();
}


void readBooks(const char* fileName, char books[MAX_BOOKS][TITLE_SIZE]) {
    ifstream in(fileName, ios::binary);
    if (!in) {
        cout << "Error reading from file!" << endl;
        return;
    }
    in.read((char*)books, sizeof(char) * MAX_BOOKS * TITLE_SIZE);
    in.close();
}


bool searchBook(char books[MAX_BOOKS][TITLE_SIZE], const char* title) {
    for (int i = 0; i < MAX_BOOKS; i++) {
        if (strcmp(books[i], title) == 0)
            return true;
    }
    return false;
}

int main() {
    char books[MAX_BOOKS][TITLE_SIZE];
    char fileName[50];
    char searchTitle[TITLE_SIZE];

    cout << "Enter filename to save books: ";
    cin >> fileName;
    cin.ignore();


    for (int i = 0; i < MAX_BOOKS; i++) {
```



```cpp
        cout << "Book " << i + 1 << ": ";
        cin.getline(books[i], TITLE_SIZE);
    }

    writeBooks(fileName, books);

    cout << "\nEnter a book title to search: ";
    cin.getline(searchTitle, TITLE_SIZE);

    readBooks(fileName, books);

    if (searchBook(books, searchTitle))
        cout << "Book found!" << endl;
    else
        cout << "Book not found." << endl;

    return 0;
}
```

Output:



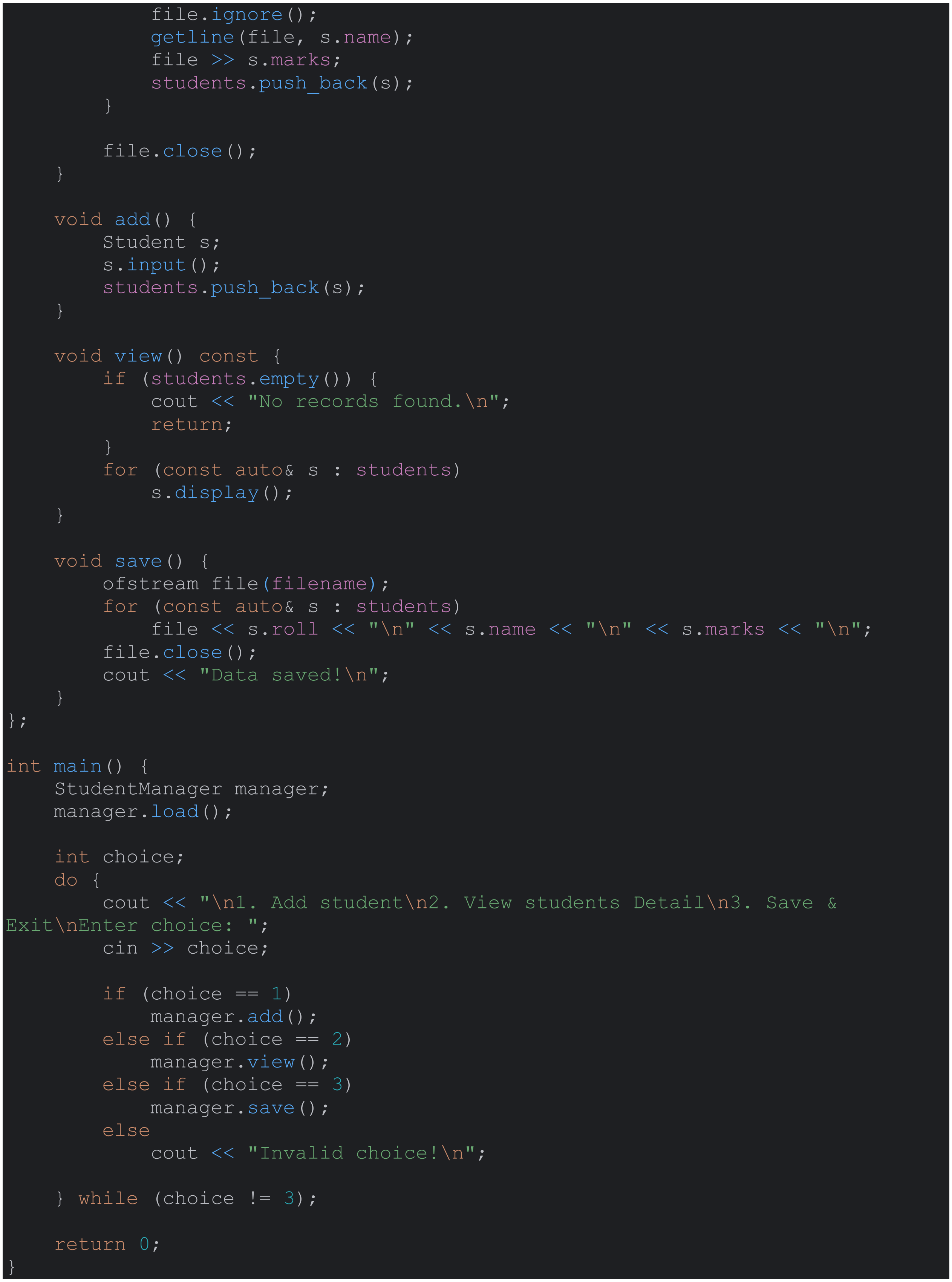
```
"/Users/manish/Desktop/Manish/work sheet 2/Task_3_1"
Enter filename to save books: library
Book 1: Maths
Book 2: science
Book 3: social
Book 4: nepali
Book 5: english
Book 6: computer
Book 7: health
Book 8: moral
Book 9: G.k.
Book 10: data base

Enter a book title to search: nepali
Book found!

Process finished with exit code 0
```

Create a program that:

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

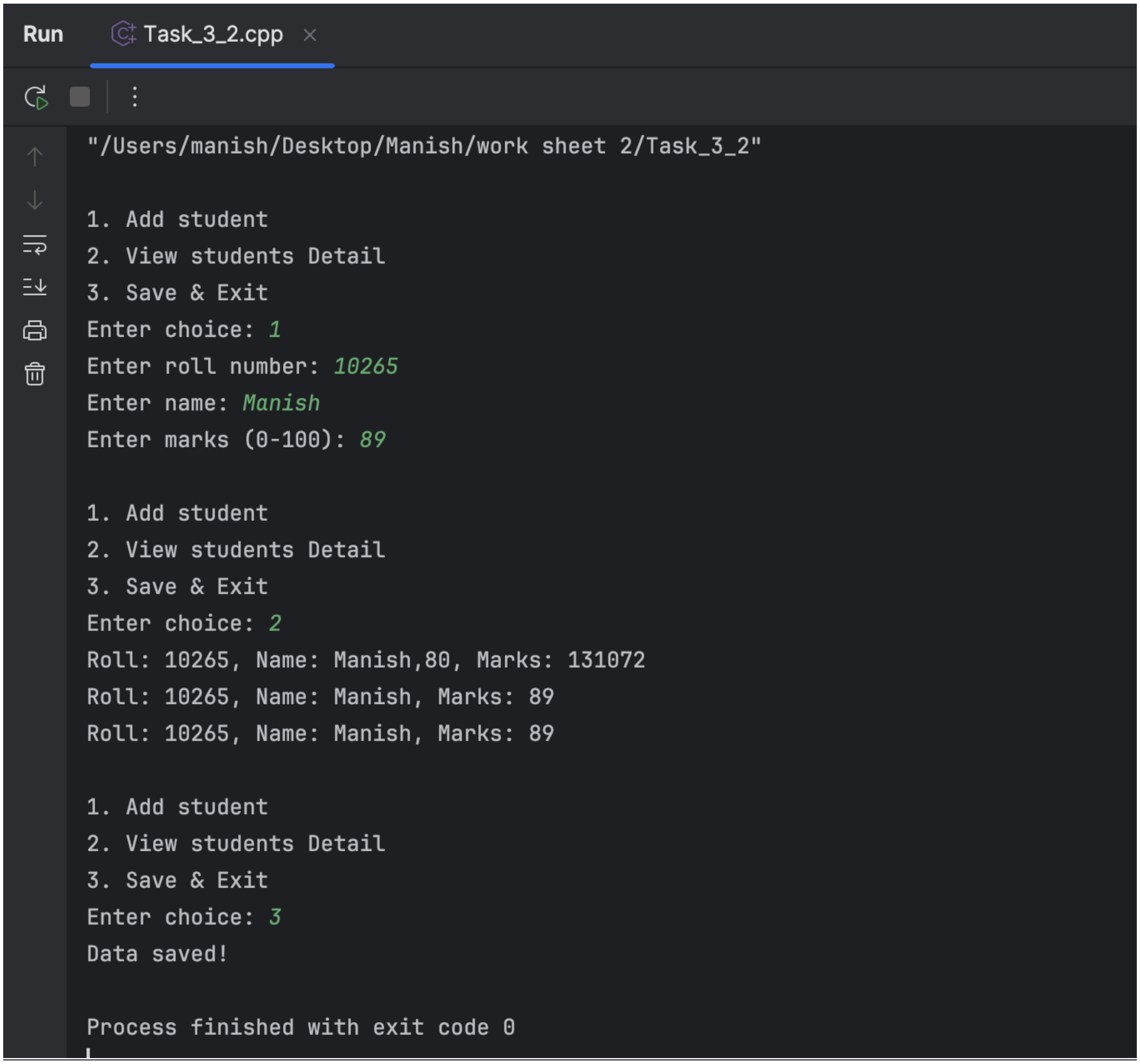
Source code for this:

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

class Student {
public:
    int roll;
    string name;
    int marks;

    void input() {
        cout << "Enter roll number: ";
        cin >> roll;
        cout << "Enter name: ";
        cin.ignore(); // clear buffer
        getline(cin, name);
        cout << "Enter marks (0-100): ";
        cin >> marks;

        if (marks < 0 || marks > 100) {
            cout << "Invalid marks!\n";
            marks = 0;
        }
    }

    void display() const {
        cout << "Roll: " << roll << ", Name: " << name << ", Marks: " <<
marks << endl;
    }
};

class StudentManager {
    vector<Student> students;
    string filename = "students.txt";

public:
    void load() {
        ifstream file(filename);
        if (!file) {
            cout << "No existing data.\n";
            return;
        }

        Student s;
        while (file >> s.roll) {
```



```
            file.ignore();
            getline(file, s.name);
            file >> s.marks;
            students.push_back(s);
        }

        file.close();
    }

    void add() {
        Student s;
        s.input();
        students.push_back(s);
    }

    void view() const {
        if (students.empty()) {
            cout << "No records found.\n";
            return;
        }
        for (const auto& s : students)
            s.display();
    }

    void save() {
        ofstream file(filename);
        for (const auto& s : students)
            file << s.roll << "\n" << s.name << "\n" << s.marks << "\n";
        file.close();
        cout << "Data saved!\n";
    }
};

int main() {
    StudentManager manager;
    manager.load();

    int choice;
    do {
        cout << "\n1. Add student\n2. View students Detail\n3. Save &
Exit\nEnter choice: ";
        cin >> choice;

        if (choice == 1)
            manager.add();
        else if (choice == 2)
            manager.view();
        else if (choice == 3)
            manager.save();
        else
            cout << "Invalid choice!\n";

    } while (choice != 3);

    return 0;
}
```

Output:



```
"/Users/manish/Desktop/Manish/work sheet 2/Task_3_2"

1. Add student
2. View students Detail
3. Save & Exit
Enter choice: 1
Enter roll number: 10265
Enter name: Manish
Enter marks (0-100): 89

1. Add student
2. View students Detail
3. Save & Exit
Enter choice: 2
Roll: 10265, Name: Manish,80, Marks: 131072
Roll: 10265, Name: Manish, Marks: 89
Roll: 10265, Name: Manish, Marks: 89

1. Add student
2. View students Detail
3. Save & Exit
Enter choice: 3
Data saved!

Process finished with exit code 0
```