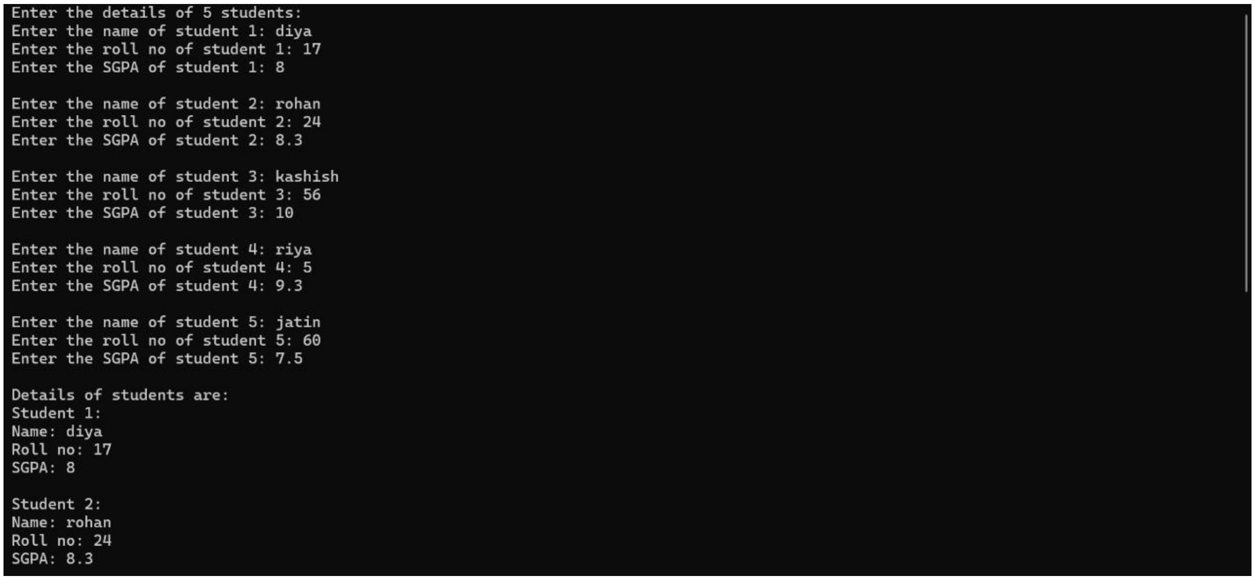
```
#include <iostream>
using namespace std;
struct student
{
    int rollno;
    string name;
    float sgpa;
};
void bubblesort(student arr[], int n)
{
    for (int i = 0; i < n-1; i++)
    {
        for (int j = 0; j < n-i-1; j++)
        {
            if (arr[j].rollno > arr[j+1].rollno)
            {
                student a = arr[j];
                arr[j] = arr[j+1];
                arr[j+1] = a;
            }
        }
    }
}
void insertionsort(student arr[], int n)
{
    for (int i = 1; i < n; i++)
    {
        student key = arr[i];
        int j = i - 1;
```

```
     while (j >= 0 && arr[j].name > key.name)
        {
            arr[j + 1] = arr[j];
            j = j - 1;
        }
        arr[j + 1] = key;
    }
}
int partition(student arr[], int low, int high)
{
    float pivot = arr[high].sgpa;
    int i = low - 1;
    for (int j = low; j < high; ++j)
    {
        if (arr[j].sgpa > pivot)
        {
            ++i;
            student temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
        }
    }
    student temp = arr[i + 1];
    arr[i + 1] = arr[high];
    arr[high] = temp;
    return i + 1;
}
```

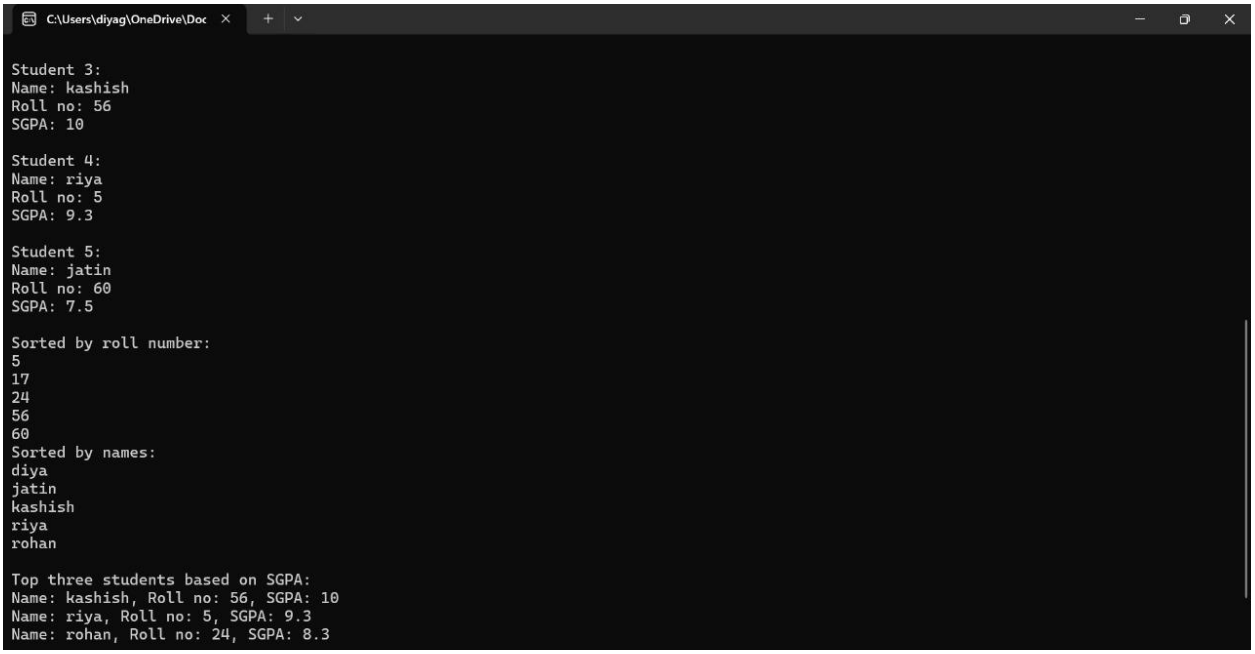
```
void quicksort(student arr[], int low, int high)
{
    if (low < high)
    {
        int pi = partition(arr, low, high);
        quicksort(arr, low, pi - 1);
        quicksort(arr, pi + 1, high);
    }
}
void searchSgpa(student arr[], int n, float search)
{
    bool found = false;
    for (int i = 0; i < n; i++)
    {
        if (arr[i].sgpa == search)
        {
            if (!found)
            {
                cout << "Students with SGPA " << search << ":" << endl;
                found = true;
            }
            cout << "Name: " << arr[i].name << endl;
        }
    }
    if (!found)
    {
        cout << "No students found with SGPA " << search << endl;
    }
}
```

```
int binarysearch(student arr[], int size, string key)
{
    int start = 0;
    int end = size - 1;
    int mid;

    while (start <= end)
    {
        mid = start + (end - start) / 2;

        if (arr[mid].name == key)
        {
            return mid;
        }
        if (key > arr[mid].name)
        {
            start = mid + 1;
        }
        else
        {
            end = mid - 1;
        }
    }
    return -1;
}
```

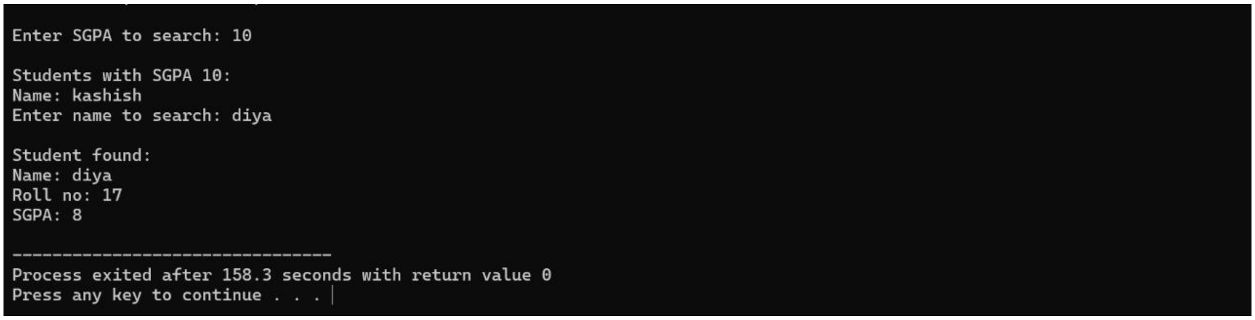
```
int main()
{
    student s[5];
    cout << "Enter the details of 5 students:" << endl;
    for (int i = 0; i < 5; i++)
    {
        cout << "Enter the name of student " << i + 1 << ": ";
        cin >> s[i].name;
        cout << "Enter the roll no of student " << i + 1 << ": ";
        cin >> s[i].rollno;
        cout << "Enter the SGPA of student " << i + 1 << ": ";
        cin >> s[i].sgpa;
        cout << endl;
    }

    cout << "Details of students are:" << endl;
    for (int i = 0; i < 5; i++)
    {
        cout << "Student " << i + 1 << ":" << endl;
        cout << "Name: " << s[i].name << endl;
        cout << "Roll no: " << s[i].rollno << endl;
        cout << "SGPA: " << s[i].sgpa << endl;
        cout << endl;
    }
// Bubble sort by roll number
    bubblesort(s, 5);
    cout << "Sorted by roll number:" << endl;
    for (int j = 0; j < 5; j++)
    {
        cout << s[j].rollno << endl;
    }
  // Insertion sort by name
    insertionsort(s, 5);
    cout << "Sorted by names:" << endl;
    for (int i = 0; i < 5; i++)
    {
        cout << s[i].name << endl;
    }
    cout << endl;
 // Quick sort by SGPA
    quicksort(s, 0, 4);
    cout << "Top three students based on SGPA:" << endl;
    for (int i = 0; i < 3; i++)
    {
        cout << "Name: " << s[i].name << ", Roll no: " << s[i].rollno << ", SGPA: " << s[i].sgpa << endl;
    }
    cout << endl;
 // Search by SGPA
    float search;
    cout << "Enter SGPA to search: ";
    cin >> search;
    cout << endl;
    searchSgpa(s, 5, search);
 // Binary search by name
    string key;
    cout << "Enter name to search: ";
    cin >> key;
    cout << endl;
  // Ensure the array is sorted by name before binary search
     insertionsort(s, 5);
     int index = binarysearch(s, 5, key);
   if (index != -1)
     {
         cout << "Student found:" << endl;
         cout << "Name: " << s[index].name << endl;
         cout << "Roll no: " << s[index].rollno << endl;
         cout << "SGPA: " << s[index].sgpa << endl;
     }
     else
     {
         cout << "Student not found." << endl;
     }

     return 0;
 }
```



```
Enter the details of 5 students:
Enter the name of student 1: diya
Enter the roll no of student 1: 17
Enter the SGPA of student 1: 8

Enter the name of student 2: rohan
Enter the roll no of student 2: 24
Enter the SGPA of student 2: 8.3

Enter the name of student 3: kashish
Enter the roll no of student 3: 56
Enter the SGPA of student 3: 10

Enter the name of student 4: riya
Enter the roll no of student 4: 5
Enter the SGPA of student 4: 9.3

Enter the name of student 5: jatin
Enter the roll no of student 5: 60
Enter the SGPA of student 5: 7.5

Details of students are:
Student 1:
Name: diya
Roll no: 17
SGPA: 8

Student 2:
Name: rohan
Roll no: 24
SGPA: 8.3
```



```
Student 3:
Name: kashish
Roll no: 56
SGPA: 10

Student 4:
Name: riya
Roll no: 5
SGPA: 9.3

Student 5:
Name: jatin
Roll no: 60
SGPA: 7.5

Sorted by roll number:
5
17
24
56
60
Sorted by names:
diya
jatin
kashish
riya
rohan

Top three students based on SGPA:
Name: kashish, Roll no: 56, SGPA: 10
Name: riya, Roll no: 5, SGPA: 9.3
Name: rohan, Roll no: 24, SGPA: 8.3
```



```
Enter SGPA to search: 10

Students with SGPA 10:
Name: kashish
Enter name to search: diya

Student found:
Name: diya
Roll no: 17
SGPA: 8

--------------------------------
Process exited after 158.3 seconds with return value 0
Press any key to continue . . .
```