#include <iostream>

using namespace std;

class StudentDatabase {

int n; // Number of students

struct Profile {

int roll;

float sgpa;

string name;

};

Profile students[100];

public:

void input() {

cout << "Enter the number of students: ";

cin >> n;

for (int i = 0; i < n; i++) {

cout << "Enter the Roll No: ";

cin >> students[i].roll;

cout << "Enter the Name: ";

cin >> students[i].name;

cout << "Enter the SGPA: ";

cin >> students[i].sgpa;

}

}

void rollsort() {

for (int i = 1; i < n; i++) {

Profile temp = students[i];

int j = i - 1;

while (j >= 0 && students[j].roll > temp.roll) {

students[j + 1] = students[j];

j--;

}

students[j + 1] = temp;

}

cout << "\nStudents sorted by Roll No in ascending order:\n";

show();

}

void ssort() {

const int maxExp = 1000;

int exp = 1;

Profile output[100];

int count[10];

// Find the maximum SGPA

float max\_sgpa = students[0].sgpa;

for (int i = 1; i < n; i++) {

if (students[i].sgpa > max\_sgpa)

max\_sgpa = students[i].sgpa;

}

while (max\_sgpa / exp > 0) {

fill(count, count + 10, 0);

for (int i = 0; i < n; i++)

count[int(students[i].sgpa \* maxExp / exp) % 10]++;

for (int i = 1; i < 10; i++)

count[i] += count[i - 1];

for (int i = n - 1; i >= 0; i--) {

output[count[int(students[i].sgpa \* maxExp / exp) % 10] - 1] = students[i];

count[int(students[i].sgpa \* maxExp / exp) % 10]--;

}

for (int i = 0; i < n; i++)

students[i] = output[i];

exp \*= 10;

}

cout << "\nTop 10 Students based on SGPA:\n";

for (int i = n - 1, rank = 1; i >= max(0, n - 10); i--, rank++) {

cout << rank << ") Roll No: " << students[i].roll

<< ", Name: " << students[i].name

<< ", SGPA: " << students[i].sgpa << "\n";

}

}

void nsort() {

for (int gap = n / 2; gap > 0; gap /= 2) {

for (int i = gap; i < n; i++) {

Profile temp = students[i];

int j;

for (j = i; j >= gap && students[j - gap].name > temp.name; j -= gap) {

students[j] = students[j - gap];

}

students[j] = temp;

}

}

cout << "\nStudents sorted alphabetically by Name:\n";

show();

}

void show() {

cout << "\nThe Student Database is as follows:\n";

for (int i = 0; i < n; i++) {

cout << i + 1 << ") Roll No: " << students[i].roll

<< ", Name: " << students[i].name

<< ", SGPA: " << students[i].sgpa << "\n";

}

}

};

int main() {

StudentDatabase db;

int choice;

do {

cout << "\nChoose one of the options:\n"

<< "1) Input the Data.\n"

<< "2) Sort by Roll No. (Insertion Sort).\n"

<< "3) Display Top 10 Students by SGPA (Radix Sort).\n"

<< "4) Sort by Name (Shell Sort).\n"

<< "5) Show Data.\n"

<< "6) Exit.\n"

<< "Enter your choice: ";

cin >> choice;

switch (choice) {

case 1:

db.input();

break;

case 2:

db.rollsort();

break;

case 3:

db.ssort();

break;

case 4:

db.nsort();

break;

case 5:

db.show();

break;

case 6:

cout << "Exiting program.\n";

return 0;

default:

cout << "Invalid choice. Please try again.\n";

}

} while (true);

return 0;

}