#include <iostream>

#include <iomanip>

#include <vector>

using namespace std;

struct Course {

string name;

double grade; // Grade on 4.0 scale

int creditHours;

};

struct Semester {

vector<Course> courses;

double semesterGPA;

double totalCredits;

};

double calculateGPA(const vector<Course>& courses, double &totalCredits, double &totalGradePoints) {

totalCredits = 0;

totalGradePoints = 0;

for (auto &course : courses) {

totalCredits += course.creditHours;

totalGradePoints += course.grade \* course.creditHours;

}

if (totalCredits == 0) return 0.0;

return totalGradePoints / totalCredits;

}

int main() {

int numSemesters;

cout << "Enter number of semesters: ";

cin >> numSemesters;

vector<Semester> semesters(numSemesters);

double overallCredits = 0, overallGradePoints = 0;

for (int s = 0; s < numSemesters; s++) {

int numCourses;

cout << "\n--- Semester " << s + 1 << " ---\n";

cout << "Enter number of courses: ";

cin >> numCourses;

semesters[s].courses.resize(numCourses);

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

cout << "\nCourse " << i + 1 << " name: ";

cin.ignore();

getline(cin, semesters[s].courses[i].name);

cout << "Enter grade (on 4.0 scale) for " << semesters[s].courses[i].name << ": ";

cin >> semesters[s].courses[i].grade;

cout << "Enter credit hours for " << semesters[s].courses[i].name << ": ";

cin >> semesters[s].courses[i].creditHours;

}

double semCredits = 0, semGradePoints = 0;

semesters[s].semesterGPA = calculateGPA(semesters[s].courses, semCredits, semGradePoints);

semesters[s].totalCredits = semCredits;

overallCredits += semCredits;

overallGradePoints += semGradePoints;

}

double cgpa = (overallCredits > 0) ? (overallGradePoints / overallCredits) : 0.0;

// Display results

cout << "\n=============================================\n";

cout << " CGPA CALCULATION \n";

cout << "=============================================\n";

for (int s = 0; s < numSemesters; s++) {

cout << "\nSemester " << s + 1 << " GPA: " << fixed << setprecision(2) << semesters[s].semesterGPA << endl;

cout << left << setw(20) << "Course Name"

<< setw(10) << "Grade"

<< setw(10) << "Credits"

<< setw(15) << "Grade Points" << endl;

cout << "---------------------------------------------\n";

for (auto &course : semesters[s].courses) {

double gradePoints = course.grade \* course.creditHours;

cout << left << setw(20) << course.name

<< setw(10) << course.grade

<< setw(10) << course.creditHours

<< setw(15) << gradePoints << endl;

}

cout << "---------------------------------------------\n";

}

cout << "\nOverall CGPA: " << fixed << setprecision(2) << cgpa << endl;

return 0;

}