CS205 C/ C++ Programming - Lab Assignment 4

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Part 1 - Analysis

- Q1,2,3,4: file io.
- Q5: switch the index of the array.

Part 2 - Code

`q123.cpp`

```cpp
#include <iostream>
#include <vector>
#include <set>
#include <fstream>
#define filename "lab_records.csv"

using namespace std;

struct Student
{
    string ID;
    int scores[14];
};

vector<Student> generateStu();
int randomInt(int low, int up);
void question2(vector<Student> &students);
void question3(vector<Student> &students);

int main()
{
    cout << "=============================Question
1=============================" << endl;
    vector<Student> students = generateStu();
    cout << students.size() << endl;
    cout << "=============================Question
2=============================" << endl;
    question2(students);
    cout << "=============================Question
3=============================" << endl;
    question3(students);
    cout << "A file named lab_records.csv is created." << endl;
    return 0;
}

vector<Student> generateStu()
{
```

```cpp
    vector<Student> students;
    set<string> IDset;
    int n;
    cout << "Please input the number of students: ";
    cin >> n;
    for (int i = 0; i < n; i++)
    {
        Student stu;
        do
        {
            stu.ID = to_string(randomInt(2000, 2020) * 10000 + randomInt(0,
9999));
        } while (!IDset.insert(stu.ID).second);
        cout << stu.ID << " :";
        for (int i = 0; i < 13; i++)
        {
            stu.scores[i] = randomInt(0, 5);
            cout << stu.scores[i] << ", ";
        }
        stu.scores[13] = randomInt(0, 5);
        cout << stu.scores[13];
        students.push_back(stu);
        cout << endl;
    }
    return students;
}

int randomInt(int low, int up)
{
    // generate random Int from [1,5];
    return (low + rand() % (up - low + 1));
}

void question2(vector<Student> &students)
{
    int count;
    cout << "the SID of the students whose absent time equal or exceed 2: " <<
endl;
    for (Student &stu : students)
    {
        count = 0;
        for (int &score : stu.scores)
        {
            if (score == 0)
            {
                count++;
            }
            if (count >= 2)
            {
                cout << stu.ID << endl;
                break;
            }
        }
    }
}

void question3(vector<Student> &students)
{
```

```cpp
        ofstream myfile(filename);
        if (!myfile.is_open())
        {
            cout << "Can not open " << filename << endl;
            exit(0);
        }
        for (Student &stu : students)
        {
            myfile << stu.ID;
            for (int &score : stu.scores)
            {
                myfile << "," << score;
            }
            myfile << "\n";
        }
        myfile.close();
}
```

q4.cpp

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

void spilit(string& s, char delim, vector<string> &elems);

int main()
{
    string filename = "lab_records.csv";
    // cout<<"Please input the filename: "<<endl;
    // getline(cin,filename);
    ifstream myfile(filename);
    if (!myfile.is_open())
    {
        cout << "Can not open " << filename << endl;
        exit(0);
    }
    string temp;
    int stu_count = 0;
    int* lab_sum = new int[14];
    double* lab_average = new double[14];
    int course_sum;
    double course_average;
    while (getline(myfile,temp))
    {
        stu_count++;
        vector<string> elems;
        spilit(temp,',',elems);
        for (int i=0;i<14;i++)
        {
            lab_sum[i] += stoi(elems[i+1]);
            course_sum += stoi(elems[i+1]);
        }
    }
```

```cpp
    course_average = (double) course_sum/(14*stu_count);
    cout << "Course average score: "<<course_average<<endl;
    cout << "The lab ID of the average score of the lab is less than the average
score of the course: "<<endl;
    for (int i = 0; i < 14; i++)
    {
        lab_average[i] = (double) lab_sum[i]/stu_count;
        if (lab_average[i] < course_average)
        {
            cout << "Lab "<<(i+1)<<" with average lab score: "<<lab_average[i]
<<endl;
        }
    }
}

void spilit(string& s, char delim, vector<string> &elems)
{
    stringstream ss(s);
    string temp;
    while (getline(ss,temp,delim))
    {
        elems.push_back(temp);
    }
}
```

`q5.cpp`

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

string trim(string &s)
{
    if (s.empty())
    {
        return "";
    }
    s.erase(0,s.find_first_not_of(" "));
    s.erase(s.find_last_not_of(" ")+1);
    return s;
}


int index(string commands[],int length, string command)
{
    for (int i = 0; i < length; i++)
    {
        if (commands[i] == command)
        {

            return i;
        }
    }
    return -1;
}

int main()
```

```
{
    string commands[] = {"start","stop","restart","reload","status","exit"};
    string command;
    while (true)
    {
        cout<<">";
        getline(cin,command);
        command = trim(command);
        for (int i = 0; i < command.length(); i++)
        {
            command[i] = tolower(command[i]);
        }
        switch (index(commands,6,command))
        {
        case 5:
            cout << "System exits."<<endl;
            exit(0);
            break;
        case -1:
            cout << "Invalid command."<<endl;
            break;
        default:
            cout << "Command " << command << " recognized."<<endl;
            break;
        }
    }

}
```

Part 3 - Result & Verification

Q1, Q2, and Q3

- Input and output:

```
11812214@cpplab2:~/HW$ cd "/home/students_home/11812214/HW/HW4/" && g++ q123.cpp -o q123 && "/home/students_home/11812214/HW/HW4/"q123
=============================Question 1=============================
Please input the number of students: 20
20010886 :3, 1, 5, 1, 4, 0, 3, 1, 2, 1, 2, 1, 5, 4
20033426 :4, 4, 5, 2, 3, 3, 2, 2, 2, 1, 1, 1, 5, 0
20033058 :5, 3, 1, 4, 1, 4, 3, 3, 3, 5, 2, 1, 2, 2
20024370 :5, 4, 1, 2, 2, 3, 2, 2, 4, 1, 3, 3, 2, 3
20176505 :4, 3, 1, 5, 0, 3, 0, 3, 2, 3, 2, 2, 3, 2
20076808 :0, 2, 2, 0, 3, 5, 2, 1, 0, 0, 2, 0, 1, 4
20048586 :0, 5, 3, 4, 2, 4, 5, 3, 5, 2, 3, 0, 4, 2
20040280 :2, 1, 3, 5, 4, 5, 4, 3, 3, 1, 3, 5, 3, 5
20158927 :3, 4, 5, 3, 0, 5, 4, 5, 5, 2, 4, 3, 2, 5
20030019 :0, 0, 4, 5, 4, 3, 0, 5, 2, 1, 2, 3, 1, 5
20117488 :2, 2, 1, 2, 1, 4, 2, 4, 0, 4, 5, 2, 3, 3
20178365 :3, 4, 4, 5, 5, 4, 5, 5, 0, 1, 2, 1, 5, 1
20153793 :2, 2, 3, 3, 0, 3, 2, 4, 1, 1, 5, 2, 2, 4
20044818 :0, 0, 3, 3, 5, 0, 2, 3, 0, 5, 2, 5, 4, 5
20135590 :5, 5, 2, 4, 3, 2, 0, 2, 1, 3, 3, 4, 2, 5
20087828 :5, 3, 4, 2, 4, 4, 5, 4, 3, 1, 1, 0, 4, 5
20158736 :4, 0, 0, 5, 2, 4, 0, 2, 2, 3, 0, 2, 0, 0
20111899 :3, 4, 2, 5, 3, 5, 3, 4, 1, 2, 4, 3, 1, 5
20052996 :3, 3, 1, 0, 2, 1, 2, 2, 2, 0, 4, 2, 0, 0
20189107 :3, 0, 1, 0, 5, 2, 4, 4, 3, 3, 2, 2, 0, 5
20
=============================Question 2=============================
the SID of the students whose absent time equal or exceed 2:
20176505
20076808
20048586
20030019
20044818
20158736
20052996
20189107
=============================Question 3=============================
A file named lab_records.csv is created.
```

```
lab_records.csv  ×

HW4 > ▦ lab_records.csv
   1   20010886,3,1,5,1,4,0,3,1,2,1,2,1,5,4
   2   20033426,4,4,5,2,3,3,2,2,2,1,1,1,5,0
   3   20033058,5,3,1,4,1,4,3,3,3,5,2,1,2,2
   4   20024370,5,4,1,2,2,3,2,2,4,1,3,3,2,3
   5   20176505,4,3,1,5,0,3,0,3,2,3,2,2,3,2
   6   20076808,0,2,2,0,3,5,2,1,0,0,2,0,1,4
   7   20048586,0,5,3,4,2,4,5,3,5,2,3,0,4,2
   8   20040280,2,1,3,5,4,5,4,3,3,1,3,5,3,5
   9   20158927,3,4,5,3,0,5,4,5,5,2,4,3,2,5
  10   20030019,0,0,4,5,4,3,0,5,2,1,2,3,1,5
  11   20117488,2,2,1,2,1,4,2,4,0,4,5,2,3,3
  12   20178365,3,4,4,5,5,4,5,5,0,1,2,1,5,1
  13   20153793,2,2,3,3,0,3,2,4,1,1,5,2,2,4
  14   20044818,0,0,3,3,5,0,2,3,0,5,2,5,4,5
  15   20135590,5,5,2,4,3,2,0,2,1,3,3,4,2,5
  16   20087828,5,3,4,2,4,4,5,4,3,1,1,0,4,5
  17   20158736,4,0,0,5,2,4,0,2,2,3,0,2,0,0
  18   20111899,3,4,2,5,3,5,3,4,1,2,4,3,1,5
  19   20052996,3,3,1,0,2,1,2,2,2,0,4,2,0,0
  20   20189107,3,0,1,0,5,2,4,4,3,3,2,2,0,5
  21   |
```

Q4

- Input and output:

```
11812214@cpplab2:~/HW$ cd "/home/students_home/11812214/HW/HW4/" && g++ q4.cpp -o q4 && "/home/students_home/11812214/HW/HW4/"q4
Course average score: 2.625
The lab ID of the average score of the lab is less than the average score of the course:
Lab 2 with average lab score: 2.5
Lab 3 with average lab score: 2.55
Lab 7 with average lab score: 2.5
Lab 9 with average lab score: 2.05
Lab 10 with average lab score: 2
Lab 11 with average lab score: 2.6
Lab 12 with average lab score: 2.1
Lab 13 with average lab score: 2.45
```

Q5

> Here we consider the functions of `trim` .

- Input and output:

```
11812214@cpplab2:~/HW$ cd "/home/students_home/11812214/HW/HW4/" && g++ q5.cpp -o q5 && "/home/students_home/11812214/HW/HW4/"q5
>     start
Command start recognized.
>stop
Command stop recognized.
>restart
Command restart recognized.
>sacdsf fs
Invalid command.
>reload
Command reload recognized.
>status
Command status recognized.
>exit
System exits.
```

Part 4 - Difficulties & Solutions

- Use `getline` to implement `spilit` .