19CSCI02P

Assignment Coursework Introduction to Programming and Problem Solving

Model Answer

#include <iostream>

#include <string>

#include <fstream>

using namespace std;

// global variables needed throughout the program

enum yearofStudy { prep, year1, year2, year3 };

string\* majorP, yearP, years[4] = { "prep", "year1", "year2", "year3" }, genders[2] = { "male","female" };

string major1 = "cs", major2 = "is", major3 = "it", major4 = "se";

// student class

class student {

private:

string name;

int id;

bool gender;

string\* majogetr;

double grades[5];

yearofStudy year;

public:

// the constructor

student() {

name = "";

id = 0;

gender = NULL;

major = NULL;

for (int j = 0; j < 5; j++)

grades[j] = NULL;

year = prep;

}

//gets the average of the 5 subjects.

double getAverageGrade()

{

int sum = 0;

for (int i = 0; i < 5; i++)

{

sum += grades[i];

}

return sum / 5.0;

}

// sets values for the class members and accesses them.

void setName(string name)

{

this->name = name;

}

string getName()

{

return name;

}

void setId(int id)

{

this->id = id;

}

int getId()

{

return id;

}

void setGender(bool gender)

{

this->gender = gender;

}

string getGender()

{

return genders[gender];

}

void setMajor(string\* major)

{

this->major = major;

}

string getMajor()

{

return \*major;

}

void setGrades(double grades[5])

{

for (int i = 0; i < 5; i++)

this->grades[i] = grades[i];

}

double getGrades(int i)

{

return grades[i];

}

void setYear(yearofStudy year)

{

this->year = year;

}

string getYear()

{

return years[year];

}

};

// delete a student with a given ID and then shift all next students to the left.

void deleteStudent(student students[20], int id)

{

int option;

bool found = 0;

do

{

found = 0;

double grades[5];

for (int i = 0; i < 20; i++)

if (students[i].getId() == id) // checks for the student

{

found = 1;

students[i].setName("");

students[i].setId(0);

students[i].setGender(NULL);

students[i].setMajor(NULL);

for (int j = 0; j < 5; j++)

grades[j] = NULL;

students[i].setGrades(grades);

students[i].setYear(prep);

for (int j = i; j < 19; j++)

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

break;

}

if (!found) // if the student is not found

{

cout << "id missing, if you want to enter another id, type 1. If you want to get back to the menu, type 0.\n";

cin >> option;

if (option)

{

"Enter the ID: ";

cin >> id;

}

}

} while (!found && option == 1);

}

// shows the info of a student then edits the info given the ID

void editStudent(student students[20], int id)

{

int option;

bool found = 0;

string\* ptr = NULL;

int academicYear;

string name;

bool gender;

string major;

double grades[5];

yearofStudy year;

do

{

found = 0;

double grades[5];

for (int i = 0; i < 20; i++)

if (students[i].getId() == id)

{

found = 1;

cout << "The info of the student: \n";

cout << "Name: " << students[i].getName() << endl;

cout << "ID: " << students[i].getId() << endl;

cout << "Gender: " << students[i].getGender() << endl;

cout << "Major: " << students[i].getMajor() << endl;

cout << "Grades: \n";

for (int j = 0; j < 5; j++)

cout << "Subject " << j + 1 << " : " << students[i].getGrades(j) << endl;

cout << "Year: " << students[i].getYear() << endl;

cout << "Please enter the new values: \n";

cout << "Name : ";

cin >> name;

students[i].setName(name);

cout << "gender (0 if male, 1 if female): ";

cin >> gender;

students[i].setGender(gender);

cout << "Major(cs, is, it, se): ";

cin >> major;

if (major == major1)

ptr = &major1;

else if (major == major2)

ptr = &major2;

else if (major == major3)

ptr = &major3;

else if (major == major4)

ptr = &major4;

students[i].setMajor(ptr);

cout << "Grades : ";

for (int j = 0; j < 5; j++)

{

cout << "\nSubject " << j + 1 << " : ";

cin >> grades[j];

}

students[i].setGrades(grades);

cout << "year (0 if prep, 1 if year1, 2 if year2, 3 if year3): ";

cin >> academicYear;

if (years[academicYear] == "prep")

year = prep;

else if (years[academicYear] == "year1")

year = year1;

else if (years[academicYear] == "year2")

year = year2;

else if (years[academicYear] == "year3")

year = year3;

students[i].setYear(year);

cout << years[year] << endl;

cout << "If you want to enter another id, type 1. If you want to get back to the menu, type 0.\n";

cin >> option;

if (option)

{

cout << "Enter the ID: ";

cin >> id;

}

}

if (!found)

{

cout << "id missing, if you want to enter another id, type 1. If you want to get back to the menu, type 0.\n";

cin >> option;

if (option)

{

cout << "Enter the ID: ";

cin >> id;

}

else

break;

}

} while (!found || option == 1);

}

// adds a student in a given position and shifts the other students after it to the right

void addStudent(student students[20], int position)

{

int i;

for (i = 1; i <= 20; i++)

{

if (students[i - 1].getId() == 0) // put the student at the end of the array

break;

}

if (position == -1 || position > i)

for (i = 1; i <= 20; i++)

{

if (students[i - 1].getId() == 0) // put the student at the end of the array

break;

}

else

{

for (int j = i; j > position; j--)

{

students[j - 1] = students[j - 2];

}

i = position;

}

i--;

string\* ptr = NULL;

int academicYear;

string name;

int id;

bool gender;

string major;

double grades[5];

yearofStudy year;

cout << "Please enter the values of the new student: \n";

cout << "Name : ";

cin >> name;

students[i].setName(name);

cout << "ID : ";

cin >> id;

students[i].setId(id); cout << "gender (0 if male, 1 if female): ";

cin >> gender;

students[i].setGender(gender);

cout << "Major(cs, is, it, se): ";

cin >> major;

if (major == major1)

ptr = &major1;

else if (major == major2)

ptr = &major2;

else if (major == major3)

ptr = &major3;

else if (major == major4)

ptr = &major4;

students[i].setMajor(ptr);

cout << "Grades : ";

for (int j = 0; j < 5; j++)

{

cout << "\nSubject " << j + 1 << " : ";

cin >> grades[j];

}

students[i].setGrades(grades);

cout << "year (0 if prep, 1 if year1, 2 if year2, 3 if year3): ";

cin >> academicYear;

if (years[academicYear] == "prep")

year = prep;

else if (years[academicYear] == "year1")

year = year1;

else if (years[academicYear] == "year2")

year = year2;

else if (years[academicYear] == "year3")

year = year3;

students[i].setYear(year);

cout << years[year] << endl;

}

//returns the number of students that satisfy a certain condition

int countStudents(student students[20], string\* majorP, string yearP)

{

int count = 0;

string academicYear;

// number of the students according to major.

if (majorP != NULL)

{

for (int i = 0; i < 20 && students[i].getId() != NULL; i++)

{

if (students[i].getMajor() == \*majorP)

count++;

}

return count;

}

else // number of the student according to year

{

for (int i = 0; i < 20 && students[i].getId() != NULL; i++)

{

if (students[i].getYear() == yearP)

count++;

}

return count;

}

}

int main()

{

//all the needed variables

int choice;

string line, \* ptr = NULL;

int academicYear, option;

bool more = 1;

string name;

int id;

bool gender;

string major;

double grades[5];

yearofStudy year;

student students[20];

fstream file;

// allowing the file to be read and written from

file.open("PrepAssignment.txt", ios::in || ios::out);

getline(file, line);

if (line.length() == 0) //checks if the file is empty

{

// if the file is empty

cout << "Please write the info of 20 students maximum:\n";

for (int i = 0; i < 20 && more; i++)

{

cout << "Please enter the info of student " << i + 1 << " :\n";

cout << "Name : ";

cin >> name;

students[i].setName(name);

file << name << endl;

cout << "ID : ";

cin >> id;

students[i].setId(id);

file << id << endl;

cout << "gender (0 if male, 1 if female): ";

cin >> gender;

students[i].setGender(gender);

file << gender << endl;

cout << "Major(cs, is, it, se): ";

cin >> major;

if (major == major1)

ptr = &major1;

else if (major == major2)

ptr = &major2;

else if (major == major3)

ptr = &major3;

else if (major == major4)

ptr = &major4;

students[i].setMajor(ptr);

file << major << endl;

cout << "Grades : ";

for (int j = 0; j < 5; j++)

{

cout << "\nSubject " << j + 1 << " : ";

cin >> grades[j];

file << grades[j] << endl;

}

students[i].setGrades(grades);

cout << "year (0 if prep, 1 if year1, 2 if year2, 3 if year3): ";

cin >> academicYear;

if (years[academicYear] == "prep")

year = prep;

else if (years[academicYear] == "year1")

year = year1;

else if (years[academicYear] == "year2")

year = year2;

else if (years[academicYear] == "year3")

year = year3;

students[i].setYear(year);

file << years[year] << endl;

cout << "Do you want to enter info for another student? 0 if no, 1 if yes\n";

cin >> more;

}

file.close();

}

//if the file is not empty

else

{

file.close();

file.open("PrepAssignment.txt", ios::in || ios::out);

file >> name;

for (int i = 0; i < 20; i++)

{

students[i].setName(name);

file >> id;

students[i].setId(id);

file >> name;

if (name == "female")

gender = 1;

else

gender = 0;

students[i].setGender(gender);

file >> major;

if (major == major1)

ptr = &major1;

else if (major == major2)

ptr = &major2;

else if (major == major3)

ptr = &major3;

else if (major == major4)

ptr = &major4;

students[i].setMajor(ptr);

for (int j = 0; j < 5; j++)

{

file >> grades[j];

}

students[i].setGrades(grades);

file >> name;

if (name == "prep")

year = prep;

else if (name == "year1")

year = year1;

else if (name == "year2")

year = year2;

else if (name == "year3")

year = year3;

students[i].setYear(year);

file >> name;

if (file.eof() != 0) // if the end of file is reached

{

file.close();

break;

}

}

}

// the list with the options

do {

cout << "Please choose one of the following options: ";

cout << "\n1) Delete a student.";

cout << "\n2) Edit the information of a student.";

cout << "\n3) Add a new student if the list is not full.";

cout << "\n4) Print the number of students in a specific major.";

cout << "\n5) Print the number of students in a specific year.";

cout << "\n6) Exit.\n";

cin >> option;

bool full = 1;

switch (option)

{

case 1:

cout << "Please enter the ID of the student : ";

cin >> id;

deleteStudent(students, id);

break;

case 2:

cout << "Please enter the ID of the student : ";

cin >> id;

editStudent(students, id);

break;

case 3:

int position;

for (int i = 0; i < 20; i++)

{

if (students[i].getId() == 0)

full = 0;

}

if (full)

cout << "Sorry, this task can not be processed as there is no room for more students.\n";

else

{

cout << "Please enter the position of the new student: ";

cin >> position;

addStudent(students, position);

}

break;

case 4:

choice = 0;

cout << "Please type which major you want (cs, is , it, es) : ";

cin >> name;

if (name == "cs")

{

majorP = &major1;

}

else if (name == "is")

{

majorP = &major2;

}

else if (name == "it")

{

majorP = &major3;

}

else if (name == "es")

{

majorP = &major4;

}

cout << "The number of students that major in " << \*majorP << " are: " << countStudents(students, majorP, years[choice]) << endl;

break;

case 5:

cout << "Please type which year you want (0 if prep, 1 if year1, 2 if year2, 3 if year3) : ";

cin >> choice;

cout << "The number of students in year " << years[choice] << " is: " << countStudents(students, NULL, years[choice]) << endl;

break;

case 6:

// deleting previous info and adding new info to the file then saving it.

file.open("PrepAssignment.txt", ios::out);

for (int i = 0; i < 20 && students[i].getId() != 0; i++)

{

file << students[i].getName() << endl;

file << students[i].getId() << endl;

file << students[i].getGender() << endl;

file << students[i].getMajor() << endl;

for (int j = 0; j < 5; j++)

{

file << students[i].getGrades(j) << endl;

}

file << students[i].getYear() << endl;

}

file.close();

break;

default:

cout << "Please enter a number from 1 to 6.\n";

break;

}

} while (option != 6);

// end of the program

return 0;

}