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//*****
//
//   Sample Solution for pa8.cc   --   Fall 2005
//
//*****
#include <iostream>
#include <fstream>
#include <iomanip>
#include <string>
using namespace std;

// Function Prototypes
int NumGrades(ifstream&, char);      // char will be 'M' or 'F'
double AvgGrade(ifstream&, char);   // char will be 'M' or 'F'
void HighLow(int&, int&);
void OutputSummary();

int main()
{
    int    choice, num, high, low;
    double avg;
    string fileName;
    ifstream inFile;

    cout << fixed << showpoint;
    cout.precision(1);
    cout << endl;

    do
    {
        cout << "1. Number of Grades for Male Students\n";
        cout << "2. Number of Grades for Female Students\n";
        cout << "3. Average Grade for Male Students\n";
        cout << "4. Average Grade for Female Students\n";
        cout << "5. Highest / Lowest Grade\n";
        cout << "6. Output Summary Information to a File\n";
        cout << "7. Quit\n\n";

        cout << "Choice: ";
        cin >> choice;

        switch(choice)      // notice that choice is a char variable
        {
            case 1:  cout << "Enter name of input file: ";
                    cin >> fileName;

                    inFile.open(fileName.c_str());
                    if (inFile.fail())
                    {
                        cout << "Error opening \"" << fileName << "\" -- "
                            << "option terminated !\n\n";
                        inFile.close();
                        inFile.clear();
                        break;
                    }

                    num = NumGrades(inFile, 'M');

                    cout << "There are " << num << " grades for male students.\n\n";
                    inFile.close();
                    inFile.clear();
                    break;

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case 2: cout << "Enter name of input file: ";
cin >> fileName;

inFile.open(fileName.c_str());
if (inFile.fail())
{
    cout << "Error opening \"" << fileName << "\" -- "
        << "option terminated !\n\n";
    inFile.close();
    inFile.clear();
    break;
}

num = NumGrades(inFile, 'F');

cout << "There are " << num << " grades for female students.\n\n";
inFile.close();
inFile.clear();
break;
case 3: cout << "Enter name of input file: ";
cin >> fileName;

inFile.open(fileName.c_str());
if (inFile.fail())
{
    cout << "Error opening \"" << fileName << "\" -- "
        << "option terminated !\n\n";
    inFile.close();
    inFile.clear();
    break;
}

avg = AvgGrade(inFile, 'M');

cout << "The average grade for male students is: " << avg
    << "\n\n";
inFile.close();
inFile.clear();
break;
case 4: cout << "Enter name of input file: ";
cin >> fileName;

inFile.open(fileName.c_str());
if (inFile.fail())
{
    cout << "Error opening \"" << fileName << "\" -- "
        << "option terminated !\n\n";
    inFile.close();
    inFile.clear();
    break;
}

avg = AvgGrade(inFile, 'F');

cout << "The average grade for female students is: " << avg
    << "\n\n";
inFile.close();
inFile.clear();
break;

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    case 5: high = -1;    // because all grades will be higher than -1
           low = 101;   // because all grades will be lower than 101
           HighLow(high,low);

           // only print high and low if they got set in HighLow function
           if (high >=0 && low <= 100)
           {
               cout << "The highest grade is: " << high << endl;
               cout << "The lowest grade is: " << low << "\n\n";
           }
           break;
    case 6: OutputSummary();
           break;
    case 7: cout << "Thanks -- and Bye !!\n\n";
           break;
    default: cout << "Invalid Selection -- Please Try Again !\n\n";
            break;
}
} while (choice != 7);

return 0;
}

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// ***** Function Definitions *****

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int NumGrades(ifstream& inFile, char gender)
{
    int num = 0, numGrades, i, grade;
    char fileGender;

    inFile >> fileGender >> numGrades;
    for(i=1;i<=numGrades;i++) // toss actual grades
        inFile >> grade;

    while(!inFile.eof())
    {
        if (gender == fileGender)
            num = num + numGrades;

        inFile >> fileGender >> numGrades;
        for(i=1;i<=numGrades;i++) // toss actual grades
            inFile >> grade;
    }
    return num;
}

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double AvgGrade(ifstream& inFile, char gender)
{
    int num = 0, sum = 0, numGrades, i, grade;
    double avg;
    char fileGender;

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inFile >> fileGender >> numGrades;

while(!inFile.eof())
{
    if (gender == fileGender)
    {
        num = num + numGrades;

        for(i=1;i<=numGrades;i++)
        {
            inFile >> grade;
            sum = sum + grade;
        }
    }
    else
        for(i=1;i<=numGrades;i++)    // "toss" grades of the wrong gender
            inFile >> grade;

    inFile >> fileGender >> numGrades;
}

avg = double(sum)/num;
return avg;
}

void HighLow(int& high, int& low)
{
    ifstream  inFile;
    string    fileName;
    int       i, num, grade;
    char      gender;

    cout << "Enter name of input file: ";
    cin >> fileName;

    inFile.open(fileName.c_str());
    if (inFile.fail())
    {
        cout << "Error opening \"" << fileName << "\" -- "
              << "option terminated !\n\n";
        return;
    }

    high = -1;        // initial value, such that ANY grade read will be higher
    low = 101;       // initial value, such that ANY grade read will be lower

    inFile >> gender >> num;

    while(!inFile.eof())
    {
        for(i=1;i<=num;i++)
        {
            inFile >> grade;

            if (grade > high)
                high = grade;

            if (grade < low)
                low = grade;
        }
    }
}

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        inFile >> gender >> num;
    }
}

void OutputSummary()
{
    ifstream  inFile;
    ofstream  outFile;
    string    fileName, fileName2;
    int       numMgrades, numFgrades, num, numFstudents=0, numMstudents=0,
             sumAll=0, i, grade;
    double    avgM, avgF, overallAvg;
    char      gender;

    cout << "Enter name of input file: ";
    cin >> fileName;

    inFile.open(fileName.c_str());
    if (inFile.fail())
    {
        cout << "Error opening \"" << fileName << "\" -- "
             << "option terminated !\n\n";
        return;
    }

    cout << "Enter name of output file: ";
    cin >> fileName2;

    outFile.open(fileName2.c_str());
    if (outFile.fail())
    {
        cout << "Error opening \"" << fileName2 << "\" -- "
             << "option terminated !\n\n";
        return;
    }

    numMgrades = NumGrades(inFile, 'M');    // count Male grades
    inFile.close();
    inFile.clear();

    inFile.open(fileName.c_str());    // re-open file & count Female grades
    numFgrades = NumGrades(inFile, 'F');
    inFile.close();
    inFile.clear();

    inFile.open(fileName.c_str());    // re-open file & sum ALL grades for total average
    inFile >> gender >> num;

    while(!inFile.eof())
    {
        if (gender == 'F')
            numFstudents++;
        else
            numMstudents++;

        for(i=1;i<=num;i++)
        {
            inFile >> grade;
            sumAll = sumAll + grade;
        }
    }
}

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    inFile >> gender >> num;
}
inFile.close();
inFile.clear();

inFile.open(fileName.c_str());
avgM = AvgGrade(inFile, 'M');
inFile.close();
inFile.clear();

inFile.open(fileName.c_str());
avgF = AvgGrade(inFile, 'F');
inFile.close();
inFile.clear();

overallAvg = double(sumAll)/(numMgrades+numFgrades);

outFile << fixed << showpoint;
outFile.precision(2);

outFile << "\n\nSummary Information for Data File: " << fileName2 << endl;
outFile << "-----\n";

outFile << "Total Number of Students: " << setw(4) << numMstudents+numFstudents
    << endl;
outFile << "                Total Male: " << setw(4) << numMstudents << endl;
outFile << "                Total Female: " << setw(4) << numFstudents << endl
    << endl;

outFile << "Overall Average Grade: " << setw(8) << overallAvg << "      ("
    << numMgrades+numFgrades << " Total Grades)\n";
outFile << "    Average Male Grade: " << setw(8) << avgM << "      ("
    << numMgrades << " Total Male Grades)\n";
outFile << "    Average Female Grade: " << setw(8) << avgF << "      ("
    << numFgrades << " Total Female Grades)\n\n";

outFile.close();

cout << "***** Summary Output to \"" << fileName2 << "\" complete!"
    << " *****\n\n";
}

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