LAB 7.1 Working with One-Dimensional Arrays

Copy and paste the following program into Visual Studio IDE.

```
// This program will read in a group of test scores (positive integers from 1
// to 100) from the keyboard and then calculate and output the average score
// as well as the highest and lowest score. There will be a maximum of 100 scores.

#include <iostream>
using namespace std;

float findAverage (int [], int);         // finds average of all grades
int findHighest (int [], int);           // finds highest of all grades
int findLowest (int [], int);            // finds lowest of all grades

int main()
{
    const int SIZE = 100;                // Define array size
    int grades[SIZE];                    // the array holding the grades.
    int numberOfGrades;                  // the number of grades read.
    int pos;                             // index to the array.

    float avgOfGrades;                   // contains the average of the grades.
    int highestGrade;                    // contains the highest grade.
    int lowestGrade;                     // contains the lowest grade.

    // Read in the values into the array
    pos = 0;
    cout << "Please input a grade from 1 to 100, (or -99 to stop)" << endl;
    cin >> grades[pos];

    while (grades[pos] != -99)
    {

        // Fill in the code to read the grades

    }

    numberOfGrades = _____ ;     // Fill blank with appropriate identifier


    // call to the function to find average
    avgOfGrades = findAverage(grades, numberOfGrades);

    cout << endl << "The average of all the grades is " << avgOfGrades << endl;

    // Fill in the call to the function that calculates highest grade

    cout << endl << "The highest grade is " << highestGrade << endl;

    // Fill in the call to the function that calculates lowest grade

    // Fill in code to write the lowest to the screen

    return 0;
}
```

```
//***************************************************************************
// findAverage
//
// task:            This function receives an array of integers and its size.
//                  It finds and returns the average of the numbers in the array
// data in:         array of floating point numbers
// data returned:   average of the numbers in the array
//
//***************************************************************************

float findAverage (int array[], int size)
{
    float sum = 0;                  // holds the sum of all the numbers

    for (int pos = 0; pos < size; pos++)
        sum = sum + array[pos];

    return (sum / size);        //returns the average
}

//***************************************************************************
// findHighest
//
// task:            This function receives an array of integers and its size.
//                  It finds and returns the highest value of the numbers in
//                  the array
// data in:         array of floating point numbers
// data returned:   highest value of the numbers in the array
//
//***************************************************************************

int findHighest (int array[], int size)
{

    // Fill in the code for this function

}

//***************************************************************************
// findLowest
//
// task:            This function receives an array of integers and its size.
//                  It finds and returns the lowest value of the numbers in the array
// data in:         array of floating point numbers
// data returned:   lowest value of the numbers in the array
//
//***************************************************************************

int findLowest (int array[], int size)
{

    // Fill in the code for this function

}
```

Exercise 1: Complete this program as directed.

Exercise 2: Run the program with the following data: 90 45 73 62 -99 and record the output.

Lab 7.2 Arrays and Functions

Copy and paste the following program into Visual Studio IDE.

```cpp
// This program will input an undetermined number of student names and a
// number of grades for each student. The number of grades is given by the user.
// The grades are stored in an array. Two functions are called for each student.
// One function will give the numeric average of their grades. The other function
// will give a letter grade to that average.
// Grades are assigned on a 10 point spread.
// 90-100 A    80-89 B    70-79 C    60-69 D    Below 60 F

#include <iostream>
#include <iomanip>
using namespace std;

const int MAXGRADE = 25;              // maximum number of grades per student

float findGradeAvg(float [], int);  // finds grade average by taking array of
                                    // grades and number of grades as parameters

char findLetterGrade(float);         // finds letter grade from average given
                                    // to it as a parameter

int main()
{
    string   firstname;               // two arrays of strings defined
    string   lastname;
    int      numOfGrades;            // holds the number of grades
    float    grades[MAXGRADE];       // grades defined as a one dimensional array
    float    average;                // holds the average of a student's grade
    char     moreInput;              // determines if there is more input

    cout << setprecision(2) << fixed << showpoint;

    // Input the number of grades for each student

    cout << "Please input the number of grades each student will receive." << endl
         << "This must be a number between 1 and " << MAXGRADE << " inclusive"
         << endl;
    cin >> numOfGrades;

    while (numOfGrades > MAXGRADE || numOfGrades < 1)
    {
        cout << "Please input the number of grades for each student." << endl
             << "This must be a number between 1 and " << MAXGRADE
             << " inclusive\n";

        cin >> numOfGrades;
    }
```

```cpp
    // Input names and grades for each student

    cout << "Please input a y if you want to input more students"
         << " any other character will stop the input" << endl;
    cin >> moreInput;

    while (moreInput == 'y' || moreInput == 'Y')
    {
        cout << "Please input the first name of the student" << endl;
        cin >> firstname;
        cout << endl << "Please input the last name of the student" << endl;
        cin >> lastname;

        for (int count = 0; count < numOfGrades; count++)
        {
            cout << endl << "Please input a grade" << endl;

          // Fill in the input statement to place grade in the array

        }

        cout << firstname << " " << lastname << " has an average of ";

        // Fill in code to get and print average of student to screen

        // Fill in call to get and print letter grade of student to screen

        cout << endl << endl << endl;
        cout << "Please input a y if you want to input more students"
             << " any other character will stop the input" << endl;
        cin >> moreInput;

    }

    return 0;
}

//**********************************************************************
// findGradeAvg
//
// task:        This function finds the average of the
//              numbers stored in an array.
// data in:     an array of integer numbers
// data returned: the average of all numbers in the array
//
//**********************************************************************

float findGradeAvg(float array[], int numGrades)
{

    // Fill in the code for this function

}
```

```
//**********************************************************************
// findLetterGrade
//
// task:           This function finds the letter grade for the number
//                 passed to it by the calling function
// data in: a floating point number
// data returned: the grade (based on a 10 point spread) based on the
//                 number passed to the function
//
//**********************************************************************

char findLetterGrade(float numGrade)
{

    // Fill in the code for this function

}
```

Exercise 1:   Complete the program by filling in the code. (Areas in bold)
                 Run the program with 3 grades per student using the sample data below.


```
Mary Brown 100 90 90
George Smith 90 30 50
Dale Barnes 80 78 82
Sally Dolittle 70 65 80
Conrad Bailer 60 58 71
```


You should get the following results:

Mary Brown has an average of 93.33 which gives the letter grade of A
George Smith has an average of 56.67 which gives the letter grade of F
Dale Barnes has an average of 80.00 which gives the letter grade of B
Sally Dolittle has an average of 71.67 which gives the letter grade of C
Conrad Bailer has an average of 63.00 which gives the letter grade of D