EGR 125 - Introduction to Engineering Methods (C++) Due date: \_\_11/16/2021\_\_\_\_\_\_\_

File: N125-Ch13LB Name: \_\_\_\_David Vermaak\_\_\_\_

**Chapter 13 Homework – Data Files**

**Reading Assignment:**

Read Chapter 13 Introduction to Programming with C++, 3rd Edition by Liang

**Problem Assignment:**

1. (20 pts) Work ***Programming Exercise 13.3*** Write a program that reads grades from a file named *Exercise13\_3.txt* Send the results to an output named using your last name. In addition to finding the average and total, number of grades.

***Contents of Exercise13\_3.txt:***

70 88 91 95

66 82 71 99 84 57

80 100 93 73 82

***Contents of Vermaak.txt:***

Your first and last name

Number of grades = 15

Total of all grades = 1231

Average grade = 82.1

* Run the program for the example above and for another example with 20 scores.
* Turn in a printout of the program as well as printouts of the two input data files and the two output data files.

**Program 13.1:**

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 11/16/2021

// Name: David Vermaak

// Project Description: Grade file editing

// Inputs: grades from a file

// Outputs: strings and doubles to a file

// [first and last name, number of grades, Total, Average]

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //This header containing cout and cin

#include <fstream> //This header contains file manipulation functions

#include <string> //This header enables string functions

using namespace std;

int main ( )

{

double temp, NumGrades = -1.0, Total = 0.0, Average = 0.0;

string NameF = " David ", NameL = " Vermaak ";

ifstream infile("F:Exercise13\_3.txt");

do

{ infile >> temp;

NumGrades++;

Total+=temp;

}while (!infile.eof());

infile.close();

Total-=temp;

Average = Total/NumGrades;

ofstream outfile("F:Vermaak.txt");

outfile

<< NameF << NameL << endl

<< "Number of grades: " << NumGrades << endl

<<"Total of all grades: " << Total << endl

<< "Average grade: " << Average << endl;

outfile.close();

return 0;

}

**Vermaak.txt:**

***David Vermaak***

***Number of grades: 15***

***Total of all grades: 1231***

***Average grade: 82.0667***

**Exercise13\_3.txt:**

***70 88 91 95***

***66 82 71 99 84 57***

***80 100 93 73 82***

***69 86 71 99 85***

**Vermaak.txt:**

***David Vermaak***

***Number of grades: 20***

***Total of all grades: 1641***

***Average grade: 82.05***

2. (21 points) **Right Triangle Analysis**: Create a data file (using Notepad, perhaps) containing the values shown below (plus add 5 more lines of your choice) and then write a C++ program as follows:

* Read the data file. Assume that it has exactly 10 lines with 2 numbers per line. Side A values are in the left column and side B values are in the right column.
* Calculate the hypotenuse, H, and the two angles, a and b (in degrees), shown in the diagram below. Assume that the sides are valid.
* Write the results to an output data file. The results should include headings and 2 digits after the decimal point for all sides and 1 digit after the decimal point for all angles. The values should align with the headings. An example is shown below.

**H**

**A**

**B**

**a**

**b**

Input data file:

**10 6**

**15 10**

**20 14**

**25 18**

**30 22**



Sides A and B a right triangle

Pick values for 5 more valid triangles

Output data file (heading plus values for 10 triangles):

**Side A Side B Side H Angle a(deg) Angle b(deg)**

**10.00 6.00 11.66 59.0 31.0**



// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 11/16/2021

// Name: David Vermaak

// Project Description: Right Triangle Solver (with data files)

// Inputs: List of numbers from a text file

// Outputs: headers and numbers out to a text file

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <fstream> //This header contains file manipulation functions

#include <iostream> //This header containing cout and cin

#include <conio.h> //This header declares getch which pauses until a key is pushed

#include <math.h> //This header allows for the use of more complex mathematical operators

#include <string> //This header enables string functions

#include <iomanip> //This header contains functions to better format output

using namespace std;

int main ( )

{

double A[5][10]; //initializing the array

ifstream infile("F:HWK\_13\_2.txt"); //initializing the file

for (int i=0; i<9; i++)

{

infile >>A[i][0]>>A[i][1]; //get side A & B from file

A[i][2] = sqrt(pow(A[i][0], 2)+pow(A[i][1], 2)); //Hypotenuse

A[i][3] =(asin( A[i][0] / A[i][2]))\* ( 180.0/3.1415); //angle A

A[i][4] = 90 - A[i][3]; //angle B

}

infile.close(); //close file

ofstream outfile("F:Vermaak.txt");

outfile << "Side A\t Side B\t Hypotenuse\t AngleA\t AngleB" << endl; //output headers to file

for (int i=0; i<9; i++) //loop to output values to file

{

outfile << fixed << setprecision(2)<<A[i][0]<<"\t "<<A[i][1]<<"\t "<<A[i][2]

<<"\t\t "<<setprecision(1)<<A[i][3]<<"\t "<<A[i][4]<<endl;

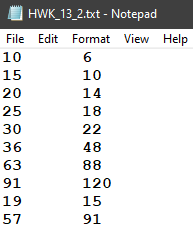
}

outfile.close(); //close file

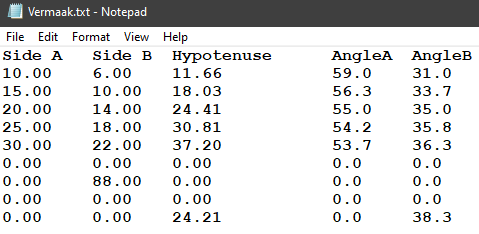
return 0;

}

**Infile:**



**Outfile:**



3. (20 points) Download the file HugeFile.txt from the course Blackboard site. This file contains a very large number of integers. The number of values per line varies.

Write a C++ program to read the file (assume that you do not know the number of values in the file) and determine (and display) each of the following:

* The number of values in the file
* The largest value in the file
* The smallest value in the file
* The number of even numbers in the file
* The number of values in the file that are greater than 80
* The number of values in the file that are less than or equal to 30

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: //2021

// Name: David Vermaak

// Project Description: Finding information about data in a file

// Inputs: Hugefile.txt

// Outputs: max, min, count, and numbers in bounds.

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <fstream> //This header contains file manipulation functions

#include <iostream> //This header containing cout and cin

using namespace std; //introduces namespace std

int main ( )

{

double temp, max, min, even, MoreEighty, LessThirty, count = -1.0;

ifstream infile("F:Hugefile.txt"); //initializing file

do

{

infile >> temp;

if (temp>max) max=temp; //finding max

if (temp<min) min=temp; //finding min

if (!temp%2) even++; //finding even numbers

if (temp>80) MoreEighty++; //finding numbers > 80

if (temp<=30) LessThirty++; //finding numbers <= 30

count++; //counting total numbers

}while (!infile.eof());

infile.close();

cout << "The number of values in the file: " << count <<endl

<< " The largest value in the file: " << max <<endl

<< " The smallest value in the file: " << min <<endl

<< " The number of even numbers in the file: " << even <<endl

<< " The number of values in the file > 80: " << MoreEighty <<endl

<< " The number of values in the file <= 30: " << LessThirty <<endl;

return 0;

}

**OUTPUT 13\_3:**

***The number of values in the file: 1257***

***The largest value in the file: 99***

***The smallest value in the file: 0***

***The number of even numbers in the file: 17***

***The number of values in the file > 80: 227***

***The number of values in the file <= 30: 419***

4. (21 points) Create a data file containing around (but not exactly) 100 integers. The numbers should be on multiple lines in the file, but do not include the same number of integers on each line of the file. Write a C++ program to read the integers into an array with a max size of 200 (i.e., search for eof marker). The program should then determine and display (on the computer screen) the average value of the numbers (a real value), the number of integers greater than the average, and the number of integers less than the average. Print the program, the data file, and the output.

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: //2021

// Name: David Vermaak

// Project Description: Finding information about data in a file

// Inputs: Hugefile.txt

// Outputs: Average, count, and the number of numbers > & < Average.

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //header containing cout and cin

#include <string>

#include <fstream> //This header contains file manipulation functions

using namespace std; //introduces namespace std

int main ( )

{

double A[200];

double Average, GreaterAv, LessAv, sum, temp, count = -1.0;

ifstream infile("F:Hugefile.txt");

do

{

int i=0; i++;

infile >> temp;

A[i] = temp;

count++;

}while (!infile.eof());

infile.close();

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

{

sum+=A[i];

}

Average = sum/count;

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

{

if( A[i] > Average ) GreaterAv++;

if (A[i] < Average)LessAv++;

}

cout << " The number of values in the file: " << count <<endl

<< " The Average of the file: " << Average <<endl

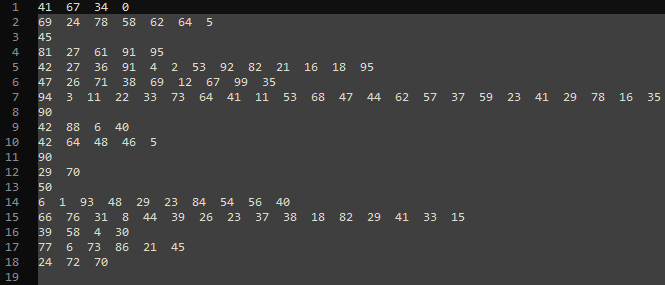
<< " The number of integers greater than the Average: " << GreaterAv <<endl

<< " The number of integers less than the Average: " << LessAv <<endl;

return 0;

}

**Hugefile.txt:**



**OUTPUT 13\_4:**

The number of values in the file: 115

The Average of the file: 0.608696

The number of integers greater than the Average: 1

The number of integers less than the Average: 114

5. (18 pts) Determine **by hand** the output of each program listed on the following pages using the data files shown below.

Contents of E:dat3.in:

Contents of E:dat2.in:

**123-45-6789**

Contents of E:dat1.in:

**9.5 8.5**

**7.5 6.5**

**5.5 4.5**

**ecrtjnrltoguowsifrtwnfresednzvepogqrusejivywrnzxwogrt**

|  |  |
| --- | --- |
| **C++ Program** | **Output** |
| // Problem 5A  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  { double x,y,z;  ifstream infile("E:dat1.in");  infile >> x >> y >> z;  cout << "x = " << x << endl << "y = " << y << endl  << "z = " << z << endl;  infile.close();  return 0;  } | **x = \_\_\_9.5\_\_\_**  **y = \_\_\_8.5\_\_\_**  **z = \_\_\_7.5\_\_\_** |
| // Problem 5B  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  { double x,z;  int y;  ifstream infile("E:dat1.in");  infile >> x >> y >> z;  cout << "x = " << x << endl << "y = " << y << endl  << "z = " << z << endl;  infile.close();  return 0;  } | **x = \_\_\_9.5\_\_**  **y = \_\_\_8\_\_\_\_**  **z = \_\_\_0.5\_\_** |
| // Problem 5C  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  { int x,y,z;  ifstream infile("E:dat2.in");  infile >> x >> y >> z;  cout << "x = " << x << endl << "y = " << y << endl  << "z = " << z << endl;  infile.close();  return 0;  } | **x = \_\_\_123\_\_\_**  **y = \_\_\_-45\_\_\_**  **z = \_\_-6789\_\_** |

|  |  |
| --- | --- |
| **C++ Program** | **Output** |
| // Problem 5D  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  {  int x,y,z;  char c1, c2;  ifstream infile("E:dat2.in");  infile >> x >> c1>> y >> c2 >> z;  cout << "Result: " << x+y+z << endl;  infile.close();  return 0;  } | **Result: \_6957\_** |
| // Problem 5E - Code interpreter  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  {  int x,y,z;  char c1,c2,c3,c4,c5;  ifstream infile("E:dat3.in");  cout << "Result: ";  for (int k = 0; k <=10; k++)  { infile >> c1 >> c2>> c3 >> c4 >> c5;  cout << c1;  }  infile.close();  return 0;  } | **Result:engineering** |
| // Problem 5F  #include <iostream>  #include <fstream>  using namespace std;  int main ( void )  {  char x,y,z;  ifstream infile("E:dat1.in");  infile >> x >> y >> z;  cout << "Results:" << endl;  cout << "x = " << x << endl << "y = " << y << endl  << "z = " << z << endl;  infile.close();  return 0;  } | **x = \_\_\_\_9\_\_\_**  **y = \_\_\_\_. \_\_**  **z = \_\_\_\_5\_\_\_** |