EGR 125 - Introduction to Engineering Methods (C++) Due date: \_\_10/21/21\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

File: N125-Ch7LB Name: \_\_\_*David Vermaak*\_\_\_\_\_\_\_\_

**Chapter 7 Homework – Single Dimensional Arrays**

**Reading Assignment:**

Read Chapter 7 in Introduction to Programming with C++, 3rd Edition by Liang

**Problem Assignments:**

**1**. (12 points) Work ***Checkpoint Exercise 7.7*** (parts a-e, and g) Write C++ statements to do the following:

a. Declare an array to hold 10 double values: ***| double Array[10];***

b. Assign value 5.5 to the last element in the array. ***| Array[(sizeof(Array)/sizeof(Array[0]))-1]= 5.5;***

c. Display the sum of the first two elements. ***| Sum = Array[0] + Array[1];***

d. Write a loop that computes the sum of the whole array.

***for (int i = 0; i<(sizeof(A)/sizeof(A[0])); i++){Sum += A[i];}***

e. Write a loop that finds the minimum element in the array.

***double n, min;***

***min = A[0];***

***n = (sizeof(A)/sizeof(A[0]));***

***for(int i = 0; i < n; i++){if(A[i] < min){ min = A[i];}}***

g. Use an array initializer to declare another array with initial values 3.5, 5.5, 4.52,

and 5.6

***double A[4]{3.5, 5.5, 4.52, 5.6};***

**2**. (42 points – 12 points per part 3\*12=36??) Write a C++ main program that calls each function listed below.

A) Include a function to find the sum of the elements of an array.

**Form of function call: Sum = ArraySum(A, Size)**

B)Include a function to swap the contents of two equal size arrays named A and B.

**Form of function call: ArraySwap(A, B, Size)**

C) Include a function to reverse the contents of an array.

**Form of function call: ArrayReverse(A, Size)**

Example output: The output should clearly show original array contents, new array contents (if modified), and the result. For example, the output for parts B, C, and A might look as follows:

**Contents of array A before swap: 1 2 3 4 5 6 7**

**Contents of array B before swap: 8 9 10 11 12 13 14**

**Contents of array A after swap: 8 9 10 11 12 13 14**

**Contents of array B after swap: 1 2 3 4 5 6 7**

**Contents of array C before reverse: 3 4 5 6 7 8 9**

**Contents of array C after reverse: 9 8 7 6 5 4 3**

**Sum of array C: 42**

Test your program for the example above (use the original contents for arrays A, B, and C above).

**3**. (15 pts) Use one loop to read the scores, then find the average, and then use another loop to count the number of scores equal to or above the average. Test the program for the following cases:

* 100, 99, 98, 88, 77, 66, 55
* Enter 20 grades or your choice (with some in the 90s, 80s, 70, and 60s)

**4.** (15 pts) Write a C++ program that defines three 1D arrays with 21 elements in each array. The arrays will be used to store temperatures in degrees F, degrees C, and Kelvin. Use a loop to initialize the array with degrees C values to 0, 5, 10, 15, …, 100. The program should then calculate the corresponding array values for degrees F and Kelvin.

Display the results neatly in a table with three columns (one for degrees C, one for degrees F, and one for Kelvin) and include table headings with units. Use 0 digits after the decimal point for degrees C and use 1 digit after the decimal point for degrees F and Kelvin.

5. (13 points) Determine the output for each part below by hand (do not compile the programs).

|  |  |
| --- | --- |
| // Array Homework: Problem 5A  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int A[ArraySize] = {2, 4, 6, 8, 10, 12, 14, 16};  double Avg, Sum = 0;  for (int j = 0; j < ArraySize; j++) Sum += A[j];  Avg = Sum/ArraySize;  cout << "Avg = " << Avg << endl;  return 0;  } | Avg = 7.2 |
| // Array Homework: Problem 5B  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int Sum1 = 0, Sum2 = 0, A[ArraySize];  for (int j = 0; j < ArraySize; j++) A[j] = 2\*j+1;  for (int j = 0; j < ArraySize; j += 2) Sum1 += A[j];  for (int j = 1; j < ArraySize; j += 2) Sum2 += A[j];  cout << "Sum1 = " << Sum1 << endl;  cout << "Sum2 = " << Sum2 << endl;  return 0;  } | Sum1 = 45  Sum2 = 55 |
| // Array Homework: Problem 5C  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int Sum1 = 0, Sum2 = 0, A[ArraySize];  for (int j = 0; j < ArraySize; j++) A[j] = j\*j;  for (int j = 0; j < ArraySize/2; j++) Sum1 += A[j];  for (int j = ArraySize-1; j >= ArraySize/2; j--) Sum2 += A[j];  cout << "Sum1 = " << Sum1 << endl;  cout << "Sum2 = " << Sum2 << endl;  return 0;  } | Sum1 = 30  Sum2 = 255 |
| // Array Homework: Problem 5D  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int Sum = 0, A[ArraySize] = {2,4,6,8,10,12,14,16,18,20};  int B[ArraySize] = {11,10,9,8,7,6,5,4,3,2},C[ArraySize];  for (int j = 0; j < ArraySize; j++) C[j] = A[j]-B[j];  for (int k = 0; k < ArraySize; k++) Sum += C[k];  cout << "Sum = " << Sum << endl;  return 0;  } | Sum = 45 |
| // Array Homework: Problem 5E  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int Sum = 0, A[ArraySize], B[ArraySize], C[ArraySize];  for (int j = 0; j < ArraySize; j++)  { A[j] = ArraySize/2 – j;  B[j] = j%2; }  for (int k = 0; k < ArraySize; k++)  { if (A[k] > B[k]) C[k]=A[k];  else C[k] = B[k];  Sum += C[k]; }  cout << "Sum = " << Sum << endl;  return 0;  } | Sum = 18 |
| // Array Homework: Problem 5F  #include <iostream>  using namespace std;  int main(void)  { int const ArraySize=10;  int Sum = 0, A[ArraySize], B[ArraySize], C[ArraySize];  for (int j = 0; j < ArraySize; j++)  { A[j] = 3\*j;  B[j] = 3\*ArraySize -2\*j; }  for (int k = 0; k < ArraySize; k++)  { if (A[k]>B[k]) C[k]=1;  else C[k] = 2;  Sum += C[k]; }  cout << "Sum = " << Sum << endl;  return 0;  } | Sum = 17 |

**Program 2:**

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// / / /

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

//

// Date: 10/21/2021

// Name: David Vermaak

// Project Description: This program uses functions to manipulate arrays

// Inputs: n/a

// Outputs: arrays

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

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

using namespace std; //introduces namespace std

//Function declarations

//Function to find the sum of the elements of an array.

double ArraySum (const int [], int);

//Function to swap the contents of two equal sized arrays

void ArraySwap (int Size, const int[], const int[], int[], int[]);

//Function to reverse the elements of an array

void ArrayReverse (int, const int[], int[]);

int main ( )

{

int Sum, size = 7;

int A[size]{1, 2, 3, 4, 5, 6, 7};

int B[size]{8, 9, 10, 11, 12, 13, 14};

int C[size]{3, 4, 5, 6, 7, 8, 9};

int S[size], T[size], R[size];

Sum = ArraySum(B, size);

cout << "Sum of array B: " << Sum <<endl;

cout << "Contents of array C before swap: ";

for (int i = 0; i < size; i++) cout << C[ i ] << " ";

cout << "\nContents of array B before swap: ";

for (int i = 0; i < size; i++) cout << B[ i ] << " ";

ArraySwap(size, C, B, S, T);

cout << "\nContents of array C after swap: ";

for (int i = 0; i < size; i++) cout << T[ i ] << " ";

cout << "\nContents of array B after swap: ";

for (int i = 0; i < size; i++) cout << S[ i ] << " ";

cout<<"\nContents of array A before reverse: ";

for (int i = 0; i < size; i++) cout << A[ i ] << " ";

ArrayReverse(size, A, R);

cout<<"\nContents of array A after reverse: ";

for (int i = 0; i < size; i++) cout << R[ i ] << " ";

}

//Function to find the sum of the elements of an array

double ArraySum (const int A[], int n)

{

double Sum;

for (int i = 0; i<n; i++){Sum += A[i];}

return Sum;

}

//Function to swap the contents of two equal sized arrays

void ArraySwap (int n, const int a[], const int b[], int S[], int T[])

{

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

{

S[i] = a[i]; T[i] = b[i];

}

}

//Function to reverse the elements of an array

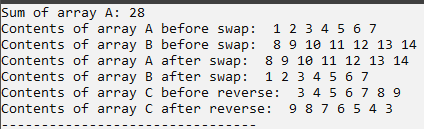
void ArrayReverse (int n, const int c[], int R[])

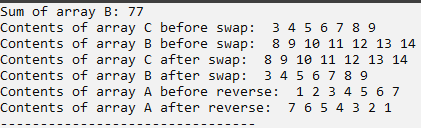
{

for(int i=0; i<n; i++) R[i] = c[n-(i+1)];

}

**Program 2 Results:**





**Program 3:**

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

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// / / /

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

//

// Date: 10/21/2021

// Name: David Vermaak

// Project Description: Finds the average grade and the number of grades above that

// Inputs: n/a

// Outputs: double Average, int number

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

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

using namespace std; //introduces namespace std

double mean (const double[], int);

int main ( )

{double Av;

int n = 0, size = 7;

const double A[size]{100, 99, 98, 88, 77, 66, 55};

Av = mean (A, size);

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

{

if (Av<= A[i]) n++;

}

cout <<"The Average = " << Av << endl <<"Number of grades above average = " << n;

return 0;

}

double mean (const double A[], int n)

{double total = 0.0;

for(int i=0; i<n; i++){total = A[i];}

return (total/n);

}

**Program 3 results:**









**Program 4:**

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

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// / / /

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

//

// Date: 10/21/2021

// Name: David Vermaak

// Project Description: Template

// Inputs: n/a

// Outputs: a formatted table

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

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

using namespace std; //introduces namespace std

int main ( )

{

int n = 0, size = 21;

double C[size], F[size], K[size];

for(int i=0; i<size; i++){ C[i] = i\*5;}

for(int i=0; i<size; i++){ F[i] = (C[i]\* 9/5 + 32);}

for(int i=0; i<size; i++){ K[i] = (C[i]+ 273.15);}

cout << "Celcius Farenheit Kelvin\n";

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

{

cout << C[i] << "\t " << F[i] << "\t " << K[i] <<endl;

}

return 0;

}

**Program 4 results:**

