Higher Diploma in Information Technology

Introduction to Programming (C++)

Year 1 Semester 1 – 2022

Tutorial 08 – Advanced Programming Techniques- Array Processing in C++ II

Question 01

BMI (Body Mass Index) is used to determine the healthiness of a person according to their height and weight. In order to calculate the BMI value and determine the BMI category, Height and weight of five students are recorded in following table.

Table 1: Height

Student	A	B	C	D	E
Height(cm)	171	180	150	165	140

Table 2: Weight

Student	A	B	C	D	E
Weight(kg)	60	55	85	70	60

a) Write a function using C++ statement called ***InputWeight( )*** which takes float array and an integer as the size of the array as parameters. The method should ask user to insert the weight of each person and fill the array. The values are entered through the keyboard and range between 45-200.

b) Write a function using C++ statement called ***InputHeight( )*** which takes float array and an integer as the size of the array as parameter. The method should ask user to insert the height of each person and fill the array. The values are entered through the keyboard and range between 140-200.

c) Write a function using C++ statement called ***CalcBMI( )*** which takes three float arrays(array1,array2 and array3) and an integer as the size of the array as parameters. The method should find and store the BMI values to an array3.

$$BMI = \frac{\text{weightInKilograms}}{\text{heightInMeters x heightInMeters}}$$

d) Write a function using C++ statement called ***MaximumBMI( )*** which takes a float array and an integer as the size of the array as parameters. The method should find and return the index of the maximum BMI value in the array.

e) Write a function using C++ statement called ***MinimumBMI( )*** which takes a float array and an integer as the size of the array as parameters. The method should find and return the minimum BMI value in the array.

f) Write a function using C++ statement called ***AverageBMI( )*** which takes a float array and an integer as the size of the array as parameters. The method should find and return the average BMI value in the array.

g) Write a function using C++ statement called ***DisplayName()*** which takes a float array and an integer as the size of the array as parameters. The method should find and return the name of the person who has highest BMI value.

h) Write a function using C++ statement called ***BMICategory( )*** which takes a float array and an integer as the size of the array as parameter. The method should find and print the BMI category of each person and the number of persons who belong to each category.

BMI value	**Category**
<18.5	Underweight
18.5 -24.9	Healthy
25 -29.9	Overweight
>30	Obese

i) Implement the main method of a C++ program to do followings

- Create float arrays with the name Height, Weight and BMI. The arrays are of size 5.
- Insert Height of each student to Height array using ***InputHeight( )*** function.
- Insert Weight of each student to Weight array using ***InputWeight( )*** function.
- Calculate and fill the BMI array using the ***CalcBMI( )*** function.
- Find and print the minimum BMI value using the ***MinimumBMI( )*** function.
- Find and print the average BMI value using the ***AverageBMI( )*** function
- Find and print the name of the person who have highest BMI value using the ***DisplayName( )*** function.
- Find and print the BMI category and number of person who belong to each category using the ***BMICategory( )*** function.

Question 02

a) Write a function using c++ statement called ***Input2DArray()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should ask user to insert the values and fill the array.

b) Write a function using c++ statement called ***Print2DArray()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should print the content of 2D array.

c) Write a function using c++ statement called ***FindMax()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should find and return the maximum value.

d) Write a function using c++ statement called ***FindMin()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should find and return the minimum value.

e) Write a function using c++ statement called ***FindSum()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should find and return the total value.

f) Write a function using c++ statement called ***FindValue()*** which takes 4 integer parameters to indicate 2D array, size of the row, size of the column and an item to search. The method should find and return the number of occurrences of the item.

g) Write a function using c++ statement called ***FindAverage()*** which takes 3 integer parameters to indicate 2D array, size of the row and size of the column. The method should find and return the average value as a float value by using the **FindSum()** function.

h) Implement the main method of a C++ program to do followings

- Create a 2D square matrix called **numbers** with size 3×3
- Insert values to **numbers** array using ***Input2DArray ()*** function.
- Print the 2D array using ***Print2DArray ()*** function.
- Find and print the maximum value using ***FindMax()*** function.
- Find and print the minimum value using ***FindMin()*** function.
- Find and print the total using ***FindSum()*** function.
- Find and print the no of occurrences of the given number using the ***FindValue().***
- Find and print the average using ***FindAverage*****()** function.