CSCI 110 -Fall Semester 2024

In class Lab 8

Assigned on Date:10/16/2024 till midnight

Due Date:10/16/2024 till midnight

Total Points: 30

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**Lab 8.1– Functions and Pseudocode (10 points)**

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| Critical Review  You have been coding with modules in pseudocode and functions when using C++.  Your modules in pseudocode can be made into void functions by not returning a value.  A function in pseudocode is a special type of module that returns a value back to the part of the program that called it. Here is the syntax for a function header:  ReturnDataType FunctionName(ParameterList)  Most programming languages provide a library of prewritten functions that perform commonly needed tasks.  Library functions are built into the programming language and you can call them as needed. They are commonly performed tasks. |

**Writing Your Own Function that Returns an Integer**

**Step 1:**  A function contains three parts: a header, a body, and a return statement. The first is a function header which specifies the data type of the value that is to be returned, the name of the function, and any parameter variables used by the function to accept arguments. The body is comprised of one or more statements that are executed when the function is called. In the following space, complete the following:

1. Write a function with the header named **addTen** that returns an Integer.
2. The function will accept an Integer variable named number.
3. The function body will add 10 to the number. The answer will be stored in the variable number.
4. The return statement will return the value of number.

Function \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_)

Set \_\_\_\_\_\_\_\_\_\_\_\_\_ = number + 10

Return \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
End Function

**Step 2:** In the following space, write a function call to your function from Step 1 to add 10 to variable number.

Set number = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

**Using Mathematical Library Function: sqrt**

**Step 1:**  The ***sqrt*** function accepts an argument and returns the square root of the argument. In the following space, complete the following:

1. Declare a variable named myNumber and a variable named squareRoot of the data type Real.
2. Ask the user to enter a number of which they want to find the square root. Store the input in myNumber.
3. Call the sqrt function to determine the square root of myNumber.
4. Display the square root to the screen.

Declare Integer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Declare Real \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Display “Enter a number:”

Input \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Set \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Display “The square root is”, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab 8.2 – C++ and Functions – Math Test ( 20 points)**

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| Critical Review  A value-returning function is a function that returns a value back to the part of the program that called it. In C++, you can use value-returning functions and those that do not.  y = sqrt(x); // value returning function  printBonus(stAmount, empAmount);// function returns no value  Standard Library Functions  C++ comes with a *standard* *library* of functions that have already been written for you. These functions, known as *library functions,* make a programmer’s job easier because they perform many of the tasks that programmers commonly need to perform.  The rand Function  In order to use the random function in C++, you must include <cstdlib> library. **You also should provide a random seed in order to get a random sequence every time you run the program** by using <ctime> library. To do this, simply add the following line to the top of your code:  #include <cstdlib>  #include <ctime>  Add the following statement in main before using the rand() function:  srand(static\_cast<unsigned int>(time(0)));  The rand() function typically returns a number between 0 and 32767. The following is how you would get a random number between 1 and 6.  value = rand() % 6 + 1; |

Write a program that will allow a student to enter their name and then ask them to solve 5 mathematical equations. The program should display two random numbers that are to be added, such as:

247 + 129

The program should allow the student to enter the answer. The program should then display whether the answer was right or wrong and accumulate the correct values. After the 5 questions are asked, display the student’s name and the number correct.

In addition to any library functions you may use, you might consider the following functions:

* A function that allows the student to enter their name.
* A function that generates two random numbers, anywhere from 1 to 500.
* A function that displays the equation and asks the user to enter their answer.
* A function that calculates the results.
* A function that displays the student’s name and the number right.

Your sample output might look as follows (random numbers will be different):

Enter student name: **Katie<Enter>**

Equation is 424 + 28

Enter the sum: **472<Enter>**

Wrong

Equation is 163 + 233

Enter the sum: **396<Enter>**

Right

Etc…(through 5 iterations)

Information for Katie

The number right: 3

**The Pseudocode**

Module main()

//Declare local variables

Declare Integer counter

Declare String studentName

Declare Integer right = 0

Declare Integer number1

Declare Integer number2

Declare Integer answer

Call srand(time(0)) // to generate random sequence each time

Set studentName = inputName()

//Loop to run program again

For counter = 1 to 5

//calls functions

Call generateNumbers(number1, number2)

Set answer = getAnswer(number1, number2)

If answer == number1 + number2 then

Display “Right”

Set right = right + 1

Else

Display “Wrong”

End If

End For

Call displayInfo(right, studentName)

End Module

Function String inputName()

Declare String name

Display “Enter student name: ”

Input name

Return name

End Function

Module generateNumbers(Integer Ref number1, Integer Ref number2)

Set number1 = rand() % 500 + 1

Set number2 = rand() % 500 + 1

End Module

Function Integer getAnswer(Integer number1, Integer number2)

Declare Integer answer

Display “Equation is ”, number1, “+”, number2

Display “Enter the sum: ”

Input answer

Return answer

End Function

Module displayInfo(Integer right, String studentName)

Display “Information for ”, studentName

Display “The number right:”, right

End Module

When your code is complete and runs properly, capture the output.  Copy and paste both the source code and the output.

Describe your experience and lessons learned with this lab.