**ITCS 1212L**

**PostLab 4**

**Introduction to Functions and Modular Programs**

**Learning Objectives:**

* **To learn the process of creating functions and function prototypes.**
* **To learn the process of calling a function.**
* **To learn how to create a modular program.**
* **Practice developing the main algorithm which is composed of different functions calls.**

1. In this part, we would like to study a menu-driven modular program. You need to look at this code, enter and execute it and answer the following questions:

* How many functions does exist in this program including main( ) ? 4 functions total
* Write pseudocode for the main( ) function, you can use if and switch as they are for the decision making. //\*I will show this pseudocode underneath all the bullet points and before the code provided\*
* What does this program do? The program utilizes a menu to determine the number of months the user would like gym membership for as well as asking what type of membership. Once all information has been gathered, the program will display the cost of membership as a product of time in months.
* If the user selects choice A, the following functions (starting from main( ) ) are going to be called. main() 🡺 showMenu() 🡺 calculateMembershipRate() 🡺 displayMembership() Yes (This is setting up next question)
* How about choices B, C, and D? B. C. and D…
* Why is this program called menu-driven and modular? This program is menu driven because the actions performed are determined by the selection the user makes within the menu. This program is modular, because each particular action is carried out by a different function.

// MY PSUEDOCODE STARTS HERE:

// I am looking at this now, and it appears the code for main() is already provided for me. Since I’m being asked for pseudo-code, I believe I am being asked to essentially summarize it in an easily digestible manner to show comprehension…

Int main()

{

// Declare variables needed.

// Will need a variable for user menu selections, months, and the membership rate

// Call the menu function and return the user selection

// The code provided is showing us a an if/else way of determining selection

// Obviously if the user does not choose ‘D’, they will need to input information

// and they are so prompted. If ‘D’ is chosen, they are allowed to exit, as promised by the menu (in the menu’s function call).

// This section could’ve been done using a switch accepting ‘A’, ‘B’, and ‘C’. Then, instead of accepting ‘D’, I would’ve left default as the exit, but a programmer could just as easily accept ‘D’ and tell the user “Have a nice day” and allow for default to catch user input error (input validation) informing the user that they must respond with an ‘A’, ‘B’, ‘C’, or ‘D’.

// The main would then need to make the function call to calculate the price within the A/B/C choices (inside that if statement or switch), and finally calling the function to display the cost. Obviously, the final case, (or else as it is written here) do not calculate or display the cost as that would be redundant and nonsensical.

// The final selection ‘D’ (or else) is run telling the user goodbye

// We follow this up with a timely return 0;

}

#include <iostream>

using namespace std;

// Function protoypes

char showMenu();

double calculateMembershipRate(char, int);

void displayMembershipRate(double);

int main()

{

// Declare variables

char choice; // To hold menu choice

int months; // To hold the number of months

double membershipRate; // To calculate the membership rates

// Function call to display the menu and return the menu

// choice

choice = showMenu();

// Accept number of months and calculate membership rates if user chooses A, B or C

if(choice != 'D') {

// Get the number of months

cout << "For how many months: " << endl;

cin >> months;

// Make a function call to calculate the membership rates. Send choice, and months as parameters

membershipRate = calculateMembershipRate(choice, months);

// Make a function call to display the final membership rate

displayMembershipRate(membershipRate);

}

else {

cout << "Goodbye !" << endl;

}

return 0;

}

// Function definition to display the menu choice and return the choice to the user

char showMenu()

{

char userChoice;

// Display the menu choices to the user

cout << "\nHealth Club Membership Menu" << endl;

cout << "A. Standard Adult Membership " << endl;

cout << "B. Child Membership " << endl;

cout << "C. Senior Citizen Membership " << endl;

cout << "D. Quit " << endl;

cout << "Enter (A, B, C or D) as your membership choice: " << endl;

cin >> userChoice;

// Return the menu choice back to the user

return userChoice;

}

// Function definition to calculate memebership rate for the user based on user choice and number of months

double calculateMembershipRate(char userChoice, int numMonths)

{

// Constants for membership rates

const double ADULT = 40.00;

const double CHILD = 20.00;

const double SENIOR = 30.00;

double rate = 0; // Variable to hold the membership rate

// Switch between user choice

switch(userChoice)

{

case 'A': // calculate the mebership rate for adult

rate = numMonths \* ADULT;

break;

case 'B': // calculate the membership rate for child

rate = numMonths \* CHILD;

break;

case 'C': // calculate the membership rate for senior

rate = numMonths \* SENIOR;

break;

default: // Invalid choice

cout << "Invalid Choice" << endl;

}

// Return the rate back to the main function

return rate;

}

// Function call to display the membership rate to the user

void displayMembershipRate(double finalRate)

{

cout << "The total charges are: $" << finalRate << endl;

}

Create a console project lab4E.cbj in codeblocks and type the above menu-driven program in it. Please contact me if you wish me to include this .cpp with Post Lab separately. Based on prior experience, I suspect you expect us to do this and save this on our personal devices, but the submission is interested in the word document and answers. Again, please let me know if you would like any .cpp submissions for this or in the future, and I will make a habit of it.

1. **Pick your vacation destination**

We are trying to create a program which shows a menu. The menu lists 4 different cities numbered 1 to 4. Option number 5 of the menu is to exit the program. There will be a program will return the weather condition for that city. Do the following tasks:

1. There should be a function called menu( ) with no parameters and a return data type of integer representing the user’s choice from the menu. Write the prototype for the function menu( ) and also implement it.

int menu(); // This is the prototype

int menu()

{

// Declare a single integer variable for user choice

Int choice;

// Display the menu options with cout statements <<

Cout << “Please enter a destination” << endl;

Cout << “1. Maimi” << endl;

Cout << “2. New York City” << endl;

Cout << “3. Australia” << endl;

Cout << “4. Germany” << endl;

Cout << “5. Not Destination. Exit Program.” << endl;

// Retrieve the user’s response

Cin >> choice;

// Return the user’s selection to the main function

Return choice;

}

1. Write a test program to test the menu( ). // I will be writing the code for main() that will implement the menu and test it. Please refer to the menu function I showed in section 2.a.

Main()

{

Int choice;

Choice = menu();

Cout << endl << endl << “This is a test and will be commented out in the final version of this program!” << endl;

Cout << endl << “The user’s selection value was equal to: “;

Cout << choice;

Cout << endl << endl;

If (choice == 1)

{

Cout << “This selection is Miami”;

}

Else if (choice == 2)

{

Cout << “This selection is New York City”;

}

Else if (choice == 3)

{

Cout << “This selection is Australia”;

}

Else if (choice == 4)

{

Cout << “This selection is Germany”;

}

Else if (choice == 5)

{

Cout << “This is to Exit Program”;

}

Else

{

Cout << “User entered an invalid selection”;

}

Return 0;

}

1. **My Portfolio**

Write a program that determines the stock price of four companies (INTL, GOOG, IBM, and MSFT) and with number of stocks for each one from the user, it calculates the total value of portfolio. It should include the following two functions, which are called inside the main() function:

* double getStocks(string s)

{

return 100.0; //We will replace this later , just use it in your program

}

String s is passed the stock symbol (string) and returns the value of each stock.

* double calculateTotalPortolioValue() has no parameters. It determines the total value of the portfolio. You need to implement this function.

Figure out the logic on paper first. On this paper :P

#include <iostream>

Using namespace std;

Double getStocks (string);

Double calculateTotalPortfolioValue();

// Declaring global variables because I am not allowed to pass into the second function

// to calculate the total value…

Int numberOfStocks;

Double valueOfStocks;

String s;

Int main()

{

// Normally I would declare variables, but the final function has sort of tied my // hands. If I declare variables locally, they will get precedence over the global

// variables I declared and the other functions will not be utilizing the same

// values. There is only one variable I can afford to declare locally here, because // it will get it’s value from being passed by the final function. Double totalValue

Double totalValue;

// Gather the stock type from user

Cout << “Please enter the symbol for the type of stock you have” << endl << endl;

Cin >> s;

// Pass the stock type to the first function (to get the value of that type/stock)

valueOfStocks = getStocks(s);

// Now to find out how many of those stocks the user owns

Cout << endl << endl << “Please enter the number of stocks owned: “

Cin >> numberOfStocks;

Cout << endl << endl;

// Time to calculate the total value with our final function call

totalValue = calculateTotalPortfolioValue();

// Display the final value

Cout << “You total portfolio value is $” << totalValue;

Cout << endl << endl << “Thank you. Have a nice day”;

Return 0;

}

Double getStocks (string s)

{

// Find out the value of the type of stock using if statements

If (s == ‘INTL’)

{

valueOfStocks = 25.22

}

Else if (s == ‘GOOG’)

{

valueOfStocks = 95.99

}

Else if (s == ‘IBM’)

{

valueOfStocks = 1.55;

}

Else if (s == ‘MSFT’)

{

valueOfStocks = 2.25;

}

Else

{

Cout << “This is not a valid selection”;

}

}

Double calculateTotalPortfolioValue()

{

// Declare the variable I am returning the value for

Double totalValue;

// Perform the calculation with global variables since I was allowed no

// parameters to play with

totalValue = valueOfStocks \* numberOfStocks;

}

4. Write a program that will read two floating point numbers (the first read into a variable called first and the second read into a variable called second and then calls the function swap with the actual parameters first and second. The swap function having formal parameters number1 and number2 should swap the value of the two variables.

#include <iostream>

Using namespace std;

void swap (float, float);

Main()

{

Float first, second;

Cout << “enter first:”;

Cin >> first;

Cout << endl << “enter second:”;

Cin >> second;

Cout << endl << endl;

swap (first, second);

return 0;

}

void swap (float number1, float number2)

{

// Simple math to convert 1 to 2 and 2 to 1.

number1 = number2 + number1;

number2 = number1 – number2;

number1 = number1 – number2;

cout << “First value is now: “ << number1;

cout << endl << “Second value is now: “ << number2;

}

5. Write a program that will input the number of wins and losses that a baseball team acquired during a complete season. The wins should be input in a parameter-less value returning function that returns the wins to the main function. A similar function should do the same thing for the losses. A third value returning function calculates the percentage of wins. It receives the wins and losses as parameters and returns the percentage (float) to the main program which then prints the result. The percentage should be printed as a percent to two decimal places.



#include <iostream>

#include <iomanip>

Using namespace std;

Int wins();

Int losses();

Float percentage(int, int);

Main()

{

Int wins, losses;

Float percentage;

Cout << endl << endl;

Wins = wins();

Losses = losses();

Percentage = percentage(wins, losses);

Cout << “The Percentage of wins is “;

Cout << fixed << setprecision(2) << percentage;

Cout << “%”;

Return 0;

}

Int wins()

{

Int wins;

Cout << “Please input the number of wins” << endl;

Cin >> wins;

Cout << endl;

Return wins;

}

Int losses()

{

Int losses;

Cout << “Please input the number of losses” << endl;

Cin >> wins;

Cout << endl;

Return losses;

}

Float percentage(int wins, int losses)

{

Float percentage;

Percentage = wins / (wins + losses);

Return percentage;

}