Fall 2012 CSC 150

**Lab #8: Functions**

**Purpose**:

1. Work with function prototypes and valued functions
2. Work with functions that have pass by value and pass by reference parameters
3. Work with non-valued (void) functions

**Lab 8.1** Work with valued functions (4 points)

Before starting the lab activity, create an empty C++ project called Lab8\_1. Make a copy of the file lab8\_1.cpp from the Lab8 folder of the course website to your project folder, and add that file to the project.

This program computes the volume and area of a cylinder or sphere using an approximate π value of 3.1416, expressed by the PI constant. We want you to replace the constant PI by a function pi() that computes and returns a more accurate value:

**pi = 2.0 \* asin(1.0);**

“double asin (double x)” is a function defined in <cmath> . It returns the principal value of the arc sine of x.

Modify the program so that replaces the PI constant by this new valued function in the statements that use PI.

Sample run of the program:

Enter 's' for sphere, 'c' for cylinder or any other char to end: s

Enter value for radius: 12.45

Sphere's volume: 8083.4483, and area: 1947.8189

Enter 's' for sphere, 'c' for cylinder or any other char to end: c

Enter value for radius: 4.38

Enter value for height: 9.67

Cylinder's volume: 582.8067, and area: 386.6609

Enter 's' for sphere, 'c' for cylinder or any other char to end: x

Program ended. Bye!

**After you run the program, show the results to the lab TA before you do the next lab activity.**

**Lab 8.2** Work with non-valued function; and pass by value and pass by reference parameters (**6 points**)

Save your lab8\_1.cpp file, and close Lab8\_1 project. Then create an empty C++ project called Lab8\_2. Make a copy of the file lab8\_2.cpp from the Lab8 folder of the course website to your project folder, and add that file to the project.

Modify the code to complete a C++ program for a payroll department to calculate the payment of monthly salary. The program will let user to enter the monthly salary of an employee, the amount of monthly contribution to pre-tax retirement plans, and the income tax rate. For simplicity, we assume the income tax rate is a single number, expressed in percentage, applicable to the entire taxable income. The program subtracts the retirement contribution from the monthly salary, then subtracts the income tax from the remaining taxable income, and finally display monthly payment after retirement contribution and income tax. The program should validate the monthly salary, monthly retirement contribution, and income tax rate. All values must be positive. In addition, the retirement contribution cannot exceed 8% of the salary, and tax rate cannot exceed 35%.

The program must use a user-defined void function called computePayment which has three parameters: salary, which is the monthly salary before retirement contribution and tax, retirement, which is the nontaxable monthly retirement contribution, and taxRate, which is the income tax rate expressed in **percentage**,. The function changes the value of salary, so that it subtracts the retirement contribution and the income tax. Therefore, the parameter of salary is used for transmitting monthly salary into the function and transmitting the calculated payment out of the function. (Hint: Consider using pass by reference for the parameter of salary)

A sample run of this program is:

Sample Run 1:

Please enter the employee's monthly salary: 1000

Please enter the employee's monthly contribution to retirement plan: 100

\*\*\* Error, retirement contribution cannot exceed 8% of the salary

Please enter the employee's monthly contribution to retirement plan: 50

Please enter the income tax rate (in percentage): 10

The monthly payment after retirement contribution and tax is: 855.00

Sample Run 2:

Please enter the employee's monthly salary: -100

\*\*\* Error, salary cannot be negative

Please enter the employee's monthly salary: 5000

Please enter the employee's monthly contribution to retirement plan: 100

Please enter the income tax Rate (in percentage): 40

\*\*\* Error, income tax Rate cannot exceed 35%

Please enter the income tax Rate (in percentage): 20

The monthly payment after retirement contribution and tax is: 3920.00

**Save your program for the second activity, compile, run and show the output of your program to the lab TA before the end of the lab period**.

**Please, return this printed lab page to the TA.**