CPE 150 Laboratory 7: Functions II

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1 Objectives

- To understand how to construct programs modularly from pieces called functions.
- To create new functions.
- To understand the mechanisms used to pass information between functions.
- To introduce simulation techinques using random number generation.
- To understand how the visibility of identifiers is limited to specific regions of programs.
- To understand how to write and use functions that call themselves.

2 Lab Note

In this lab, create a header file to include the proper user-defined function prototypes, then create a source file to include only the implementation for these user-defined functions. The main driver for your solution should be in a separate source file that includes the user-defined function using proper directives.

3 Lab Exercise 1 - Triangle Types

Define an enumeration type, `triangleType`, that has the values `scalene`, `isosceles`, `equilateral`, and `noTriangle`. Write a function, `triangleShape`, that takes as parameters three numbers, each of which represents the length of a side of the triangle. The function should return the shape of the triangle. (Note: In a triangle, the sum of the lengths of any two sides is greater than the length of the third side.). Then, write a function that outputs for each enum constant a corresponding message type. Finally, Write a program that prompts the user to input the length of the sides of a triangle and outputs the shape of the triangle.

4 Lab Exercise 2 - Overloaded Hospital

Write a program that computes and displays the charges for a patient's hospital stay. First, the program should ask if the patient was admitted as an in-patient or an outpatient. If the patient was an in-patient, the following data should be entered:

- The number of days spent in the hospital
- The daily rate

- Hospital medication charges
- Charges for hospital services (lab tests, etc.)

The program should ask for the following data if the patient was an out-patient:

- Charges for hospital services (lab tests, etc.)
- Hospital medication charges

The program should use two overloaded functions to calculate the total charges. One of the functions should accept arguments for the in-patient data, while the other function accepts arguments for out-patient information. Both functions should return the total charges.

[*Optional*: *Input Validation*] Do not accept negative numbers for any data.

5 Lab Exercise 3 - Prime Number List

A prime number is a number that is only evenly divisible by itself and 1. For example, the number 5 is prime because it can only be evenly divided by 1 and 5. The number 6, however, is not prime because it can be divided evenly by 1, 2, 3, and 6. Write a function name `isPrime`, which takes an integer as an argument and returns `true` if the argument is a prime number, or `false` otherwise. Use the `isPrime` function in a program that prints a list of all the prime numbers from 1 through 100.

6 Postlab Exercise

Computers are playing an increasing role in education. Write a program that will help an elementary school student learn multiplication. Use `rand` to produce two positive one-digit integer. The program should then output a question using the numbers, such as:

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How much is 6 times 7?
```

The student then types the answer. The program checks the student's answer. If it is correct, print "`Very good.`" and ask another multiplication question. If the answer is wrong, print "`No, Please try again.`", and let the student try the same question repeatdly until the student gets it right.