CPE 150 Laboratory 6: Functions I

Department of Computer Engineering
Yarmouk University

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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 Exercise 1 - Falling Distance

When an object is falling because of gravity, the following formula can be used to determine the distance the object falls in a specific time period:

$$d = \frac{1}{2}gt^2$$

The variables in the formula are as follows: d is the distance in meters, g is 9.8, and t is the amount of time, in seconds, that the object has been falling. Write a function named `fallingDistance` that accepts an object's falling time (in seconds) as an argument. The function should return the distance, in meters, that the object has fallen during that time interval. Write a program that demonstrates the function by calling it in a loop that passes the values 1 through 10 as arguments and displays the return value.

3 Lab Exercise 2 - Coin Toss

Write a function named `coinToss` that simulates the tossing of a coin. When you call the function, it should generate a random number in the range of 1 through 2. If the random number is 1, the function should display "heads." If the random number is 2, the function should display "tails." Demonstrate the function in a program that asks the user how many times the coin should be tossed and then simulates the tossing of the coin that number of times.

4   Lab Exercise 3 - Circle Calculator

The following formula gives the distance between two points, (x_1, y_1) and (x_2, y_2) in the Cartesian plane:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Given the center and a point on the circle, you can use this formula to find the radius of the circle. Write a program that prompts the user to enter the center and a point on the circle. The program should then output the circle's radius, diameter, circumference, and area. Your program must have at least the following functions:

- `calculateDistance`: This function takes as its parameters four numbers that represent two points in the plane and returns the distance between them.

- `calculateRadius`: This function takes as its parameters four numbers that represent the center and a point on the circle, calls the function distance to find the radius of the circle, and returns the circle's radius.

- `calculateCircumference`: This function takes as its parameter a number that represents the radius of the circle and returns the circle's circumference.

- `calculateArea`: This function takes as its parameter a number that represents the radius of the circle and returns the circle's area.

Assume that $\pi = 3.1416$.

5   Postlab Exercise

During winter when it is very cold, typically, everyone would like to know the windchill factor, especially, before going out. Meteorologists use the following formula to compute the windchill factor, W:

$$W = 35.74 + 0.6215 \times T - 35.75 \times V^{0.16} + 0.4275 \times T \times V^{0.16}$$

where V is the wind speed in miles per hour and T is the temperature in degrees Fahrenheit. Write a program that prompts the user to input the wind speed, in miles per hour, and the temperature in degrees Fahrenheit. The program then outputs the windchill factor. Your program must contain at least two functions: one to get the user input and the other to determine the windchill factor.