2022 Spring -- CSCI 1300L
Lab 06: Writing functions

Introduction

In this lab, you will practice writing functions in Python to implement the codes for computations in elementary geometry. Functions are used for modulization in a large program. As each function serves the program for a specific purpose, the use of functions can make the entire program more maintainable.

Lab objectives

After completing this lab, you will be able to:
(1) understand the use of functions in Python,
(2) create basic functions using def statements,
(3) create value-returning functions using def and return statements, and
(4) understand and establish the scope of a variable as either local or global.

Assignment

You will create a program to deal with the following calculations from each function.

(1) Perimeter of a rectangle. User inputs 2 values: length and width. The function calculates the perimeter of that rectangle:
    *perimeter = 2 * (length + width)*.
(2) Area of a rectangle. User inputs 2 values: length and width. The function calculates the area of that rectangle:
    *area = length * width*.
(3) Edge length of a cuboid. User inputs 3 values: length, width, and height. The function calculates the edge length of a cuboid:
    *edge_length = 4 * (length + width + height)*.
(4) Surface area of a cuboid. User inputs 3 values: length, width, and height. The function calculates the surface area of a cuboid:
    *surface_area = 2 * (length * width + length * height + width * height)*.
(5) Volume of a cuboid: User inputs 3 values: length, width, and height. The function calculates the volume of a cuboid:
    *volume = length * width * height*.

Additionally, the program has 2 more functions that evaluate the user input of values and determines if such a shape is a square or a cube.

(6) A square is a special kind of rectangle where its length equals to its width. After the user inputs 2 values: length and width, if these 2 have the same value, the function tells that the input is a square.

(7) A cube is a special kind of cuboid where its length, its width, and its height have the same value. After the user inputs 3 values: length, width, and height, if these 3 have the same value, the function tells that the input is a cube.

Your program should allow the user to enter 2 (for the rectangle) or 3 (for the cuboid) numbers. Then, the program should calculate the results by calling the functions (1)(2)(6) if there are 2 input values, or functions (3)(4)(5)(7) if there are 3 input values.

The program should perform its functions in the following way. Note that these are examples only. You do not have to strictly follow the exact input/output.

Program asks: rectangle or cuboid? r for rectangle, c or cuboid.
User inputs: r
Program asks: length = ?
User inputs: 15
Program asks: width = ?
User inputs: 10
Program output: Perimeter is 50; area is 150. It is not a square.

Program asks: rectangle or cuboid? r for rectangle, c or cuboid.
User inputs: r
Program asks: length = ?
User inputs: 10
Program asks: width = ?
User inputs: 10
Program output: Perimeter is 40; area is 100. It is a square.

Program asks: rectangle or cuboid? r for rectangle, c or cuboid.
User inputs: c
Program asks: length = ?
User inputs: 1.0
Program asks: width = ?
User inputs: 2.5
Program asks: height = ?
User inputs: 5
Program output: Edge length is 34.0; surface area is 40.0; volume is 12.5. It is not a cube.

Program asks: rectangle or cuboid? r for rectangle, c or cuboid.
User inputs: r
Program asks: length = ?
User inputs: 1.0
Program asks: width = ?
User inputs: 1.0
Program asks: height = ?
User inputs: 1.0
Program output: Edge length is 12.0; surface area is 6.0; volume is 1.0. It is a cube.

Your program does not need to continue to accept user's input following one set of computations (i.e. no loop is required in the program). However, it is important that the program consists of functions as listed in the requirement. Each function should accept the user's input values in the *argument*, e.g. your_function(*length*, *width*). Furthermore, the function should output or pass the values or messages after its execution, with or without a return statement.

Functions should be written with def statements. The main program will load functions accordingly. Moreover, you may need to write decision structures such as if/elif/else in the program.

Since the focus of this assignment is to write functions in the program, you do not need to worry about any user inputs that do not make sense, such as a negative value or a string. We assume that all user inputs are valid and with a correct number data type. However, the calculation and determination in the functions should be correct.

Submission instruction

After you have completed the assignment, upload and submit the Python source code file *Lab06.py* to eLC. Always double check that your submission was successful on eLC.

Grading

A score between 0 and 5 will be assigned.

1. The program can successfully accept an end user's inputs and determines whether to process a rectangle or a cuboid. (0.5 point)
2. Each function is correctly defined, successfully implemented, including, but not limited to: calling the function, accepting and passing the value inputs, and giving the correct outputs upon loading and execution. If you are not using independent functions to implement the program, you will receive no credit for this assignment. (0.5 * 7 = 3.5 points)
3. Only a single source code file is submitted and no other file is submitted (0.5) and the entire Python program can be executed without any additional error (0.5). (1 point)

Special notice regarding the submission:

Late submission penalty. Points will be deducted from the original grade. If your submission is after the posted deadline…

(1) within 24 hours: -2
(2) between 24 hours and 48 hours: -3
(3) between 48 hours and 72 hours: -4
(4) after 72 hours: assignment will not be accepted.