

CSCI 1320 Computer Science I: Engineering Applications – Fall 2018

Instructor: Zagrodzki

Assignment 2 – Due Sunday, Sept 16th, by 6:00 pm

Objectives: understand the difference between Matlab scripts and functions

- Understand the idea of modular programming
- Understand the terminology regarding functions and their use: calling a function, passing arguments, returning values
- Convert a part of a script into a function
- Test the function
- Call a function from inside a script

All your files should include at the top your name, course no., assignment no., and instructor name.

Calculator+ (cont.)

The following problem was introduced in Lab 1: we want to write a program that inputs two numbers as floating point, then prints out the results of

- o adding them together
- o subtracting the second from the first
- o multiplying them together
- o dividing the first by the second
- o dividing the first into the second

A possible sample run is given:

```
First number: 23.0
Second number: 10

23.0 + 10.0 = 33.0
23.0 - 10.0 = 13.0
23.0 * 10.0 = 230.0
23.0 / 10.0 = 2.3
23.010.0 = 4.1427e+13
```

In Task 4 of Lab2, you wrote a script so achieve the functionality of the Calculator program, matching the sample run.

Task 1 (30 points) Add a fifth operation to the program you wrote in Lab 1. The specifications are:

Dividing the first (x) by the second (y) results in a value (let's call it z).

$$z = x/y$$

If z is greater than x but less than y , the result is a logical TRUE. If the result of the division does not fall between x and y , the output is a logical FALSE.

i.e. If $x < z < y$, result is TRUE. Otherwise, result is FALSE.

Give pseudocode in a text format, then write the MATLAB code by appending to the m-file you created for Lab 1 (`<lastname><Firstname>CalcScriptA.m`).

Task 2 (24 points) Write six functions addressing the functionality needed by the Calculator program. Below are the function headers for your reference.

```
function [ out] = addFunc( input1, input2)
function [ out] = subtractFunc( input1, input2)
function [ out] = multFunc( input1, input2)
function [ out] = divbyFunc( input1, input2)
function [ out] = divintoFunc( input1, input2)
function [ out] = quotientInBoundsFunc( input1, input2)
```

Task 3 (16 points) Create a new script. This script should be a modified version of the original script such that each of the 6 operations is replaced by the appropriate function call. Name your script *<lastname><Firstname>CalcScriptB.m*. Run some sample values through your program to verify correct outputs. (At your grading interview your grader might try different values to verify correctness.)

Scripts vs. Functions

Task 4 (15 points) In thermodynamics, the Carnot efficiency is the maximum possible efficiency of a heat engine operating between two reservoirs at different temperatures. The Carnot efficiency is given as

$$\eta = 1 - \frac{T_c}{T_H}$$

, where T_c and T_H are the absolute temperatures at the cold and hot reservoirs, respectively. Write a script *carnot.m* that will:

- a) prompt the user for the two reservoir temperatures in Kelvin,
- b) call a function to calculate the Carnot efficiency, and then
- c) print the corresponding Carnot efficiency to 3 decimal places.

Note: You will need to write the function as well.

Task 5 (15 points) In CS it is often necessary to design logic that has a specific result based on some set of inputs. Let's say we have 3 logical variables, X, Y, and Z that store the values of 3 inputs. Design a logic that would output true only if X and Y are true, or if Z is false.

- A. How many different combinations can we have given the 3 logical variables?
- B. Write a logical statement for the given logic (use MATLAB syntax).
- C. Create a truth table showing all of the possible variable combinations and the result for each combination.

Submitting the assignment:

Copy the code from all the scripts and function files into a text document, indicating the task number. Include the call statements from Task 2. Convert your text file to pdf and save it as *<first_name>.<last_name>_Hwk2.pdf*. Zip this file with all your .m files and submit the resulting file on Moodle by due date.