QMB 6358: Software for Business Analytics
Department of Economics
College of Business
University of Central Florida
Fall 2023

Assignment 1

Due Monday, September 4, 2023 at 11:59 PM
in your GitHub repository

Instructions:

Complete this assignment within the space on your GitHub repo in a folder called `assignment_01`. When you are finished, submit it by uploading your files to your GitHub repo either using the interface in a browser or through GitHub Desktop. You are free to discuss your approach to each question with your classmates but you must upload your own work.

Question 1:

Two junior analysts at your firm have written RAP programs to calculate the difference between two numbers on a register machine. One has produced the simple script `SUB_12_4.txt` and the other has proposed a more complicated solution in the script `SUB_12_34.txt`.

Run each program with two *test cases.* That is, for each test case, find two numbers to place in registers 1 and 2, such that the difference will be stored in register 4. One test case should return the correct value in register 4 for both scripts. Find another example that returns an incorrect value when one of the scripts is run. This should help you decide which script to use.

You will store the results in your folder `assignment_01` and the images will display online if you also include the file `README.md`, from the same folder in the class repository at `https://github.com/LeeMorinUCF/QMB6358F23`.

a) Browse to the Webpage `https://rodrego.it.tufts.edu/`, where you will run the RAP programs.

b) Test the script `SUB_12_4.txt` as follows:

    i) Choose two numbers to subtract that will test this program. Enter the first number in register 1 and the second in register 2.

    ii) Take a screen shot of the Rodrego program in this initialized state and save it in `png` format as `SUB_12_4_init.png`. You might want to crop the image to show only the Rodrego screen.

    iii) Copy the script `SUB_12_4.txt` into the command window on the right. Run the program `SUB_12_4.txt` to completion by clicking "Play."

    iv) Take a screen shot of the Rodrego program in this completed state and save it in `png` format as `SUB_12_4_end.png`. You might want to crop the image to show only the Rodrego screen.

c) Repeat the steps in (b) to test the script `SUB_12_34.txt`, using the same two numbers, to produce the image files `SUB_12_34_init.png` and `SUB_12_34_end.png`.

d) Modify the `png` file names depending on whether both scripts returned the correct value in register 4. That is, if the example failed for one script, add the suffix “`_fail`” to both sets of files, otherwise, add the suffix “`_pass`”, as in `SUB_12_4_init_pass.png` for all four files.

e) Repeat the steps in (b), (c), and (d) to test both scripts using a different set of numbers. If both scripts gave correct answers the first time, continue to choose numbers until you find an example where one of them returns an incorrect value. Conversely, if one script was incorrect the first time, find an example where both are correct. Label the new files with “`_pass`” or “`_fail`” accordingly.

f) Upload all *eight* `png` files into the `assignment_01` folder on your GitHub repo. When you refresh your browser, you should see the images appear on the page. If not, verify that you have named the files precisely as specified, otherwise upload new image files, if necessary. Review the commands in the file `README.md` to verify that you have all *eight* file names correct.

Question 2:

A newly-hired Data Scientist at your company has written a set of programs, available in the file `Q2_functions.R`. As Senior Data Scientist, you are in charge of testing their work for accuracy. The way you will do this is by producing *test cases.* That is, you will provide examples of function calls that pass arguments to the functions and verify that the answer is as you expect. You will find that in each function the junior Data Scientist has made a mistake, so that the function returns an incorrect value. For each function, create *three* examples of function calls, including some that return a correct value and at least one that returns an incorrect value.

To get started, download and install R and RStudio (in that order). Then open RStudio and open the file `Q2_functions.R`. To run the script and load the function definitions, press either the “Source” button in the upper left “‘Rscript” pane or the hot keys “Ctrl+Shift+S”. To run a single line of code, such as one of your examples, highlight the text and press the “Run” button or or the hot keys “Ctrl+Enter’.

- The function `is_it_3_or_4(num_in)` should determine whether the number input, `num_in`, is equal to either 3 or 4.
- The function `multiples_of_ten(num_1, num_2)` should *print to screen* all multiples of 10 *between* the numbers input, `num_1` and `num_2`, *not* including `num_1` or `num_2`.
- The function `count_even_numbers(num_in)` should *count* all even numbers between zero and the number input, `num_in`, *including* `num_in`, if appropriate.

You may record all your answers in the script `Q2_functions.R` by writing in all nine of your function calls in the lines of the script that begin with `# Add a different function call in this line`. Make sure the script `Q2_functions.R` is also saved in the folder `assignment_01`.

It will help the end user, i.e. me, your instructor, if your failing test case is labeled with a comment that describes the failure.