

BUAI 492

Individual Homework #2

INSTRUCTIONS: For all programs, you are expected to use good programming style (including good variable names and *some data validation*). Before class on the due date listed in the syllabus, upload to *Canvas ONE Jupyter Notebook* file with your solutions to the following exercises. The solution to each exercise should be stored, in order, in a separate cell whose first line is a comment with the exercise number (for example, *#EXERCISE 1*) and followed by your solution). For any exercise whose solution is not a computer program, write your answer as a comment. **Unless otherwise stated, ALL inputs to functions should be parameters and include a main program that calls the function and displays the result. Use only statements that you have learned in the lectures. Failing to follow these instructions will result in a loss of points. DO NOT COPY SOMEONE ELSE'S ANSWERS!**

Exercise 1. What does the print statement in the following function *circle* produce? What does the print statement in the main program produce? Explain why this happens. (5 points)

```
def circle(radius, circumference):  
    pi = 3.14159; circumference = 2 * pi * radius  
    print(circumference)  
    return circumference
```

```
#Main program starts here.  
circumference = 0.0  
circle(2, circumference)  
print(circumference)
```

Exercise 2. Write a function called *area* that computes and returns the area of the circle whose radius is an input parameter. Include a main program that gets the radius from the user, calls the function, and displays the results. (5 points)

Exercise 3. Write two functions called *IsEven1* and *IsEven2* that return the value 1 if a given positive integer is even and 0 otherwise, as follows: (10 points)

IsEven1: Using only one assignment statement and the mod operator %.

IsEven2: Using only one assignment statement but not the mod operator %.

Exercise 4. Write a program that asks the user for a date in the form *dd/mm* and then uses a for loop to compute and displays the number of days since the beginning of the year to the given date. For example, the date 05/02 should produce 36. You can assume that February has 28 days. (**Hint:** Create a tuple that contains the number of days in each of the 12 months.) (15 points)

Exercise 5. Write a program that asks the user for a real number x and then computes the following formula for finding the value of e^x :

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Continue adding terms in the series so long as $\text{abs}(x^n / n!) > 10^{-7}$. (15 points)

Exercise 6. The subscript of a Python list must be an integer or a slice. The purpose of this exercise is to write a function called *SubList* that allows the user to obtain elements of a list by providing a separate *list* of desired subscripts. For example, if the original list is [12, 20, 24, 16] and the user wants elements whose subscripts are in the list [1, 3], then the function *SubList* should return [20, 16]. Write the function *SubList* that does this (your function should work for all inputs). Include a main program that calls the function and prints the values of the original list and the sublist. (15 points)

Exercise 7. Given an existing EXCEL file, write functions *CountRows* and *CountCols* that use the package *openpyxl* to perform each of the following tasks (make the worksheet variable an input parameter):

- Given the row and column numbers of a starting cell with a value in it, return the number of consecutive nonempty cells to the right of (and including) the starting cell, until finding the first empty cell.
- Given the row and column numbers of a starting cell with a value in it, return the number of consecutive nonempty cells below (and including) the starting cell, until finding the first empty cell.

Include a main program that asks the user to enter the location and name of the EXCEL file and then allows the user to enter the row and column numbers of a starting cell and reports the number of consecutive cells both to the right and also below the starting cell. (20 points)

Exercise 8. Write a program to perform the following tasks given the data of a Transportation Problem (TP) that is stored in the EXCEL file *CCCTransp.xlsx*. (**Note:** Your program should work not just for the 3 plants and 3 customer in the file *CCCTransp.xlsx* but for any number up to 25 plants and 25 customers.) (25 points)

- Get the directory and name of the file from the user.
- Count and store the number of plants (rows) and number of customers (columns) (this would be 3 and 3 in the sample file). You can assume the data always start in cell B4.
- For each row, store a *formula* (which is a string) for the row sum in the column immediately to the left of the column labeled “Supplies,” which will always be 3 columns to the right of the last customer (column F in the sample file)
- For each column, store a *formula* for the column sum in the row immediately above the row labeled “Demands,” (row 8 in the sample file) which will always be 3 rows below the last plant.