

ENG 101 – Python Homework #1

Due Tuesday, November 12 at 11:59 pm (Canvas submission)

For all of the functions in this assignment, set up a docstring with the information you had to enter in MATLAB assignments. Save all functions in ONE document called “**HW1.py**”

1. The energy in joules released for a particular Richter scale measurement is given by:

$$E = 10^{(1.5*r)+4.8}$$

where E is energy measured in joules and r is the Richter scale measurement (typically on a scale from 1-10 as a floating-point number). One ton of exploded TNT yields $4.184 \cdot 10^9$ Joules. Thus, you can relate the energy released in Joules to tons of exploded TNT.

Write a Python function called “**Richter.py**” with one input array and two outputs. For each Richter scale value in the input array (set up a for loop), calculate the energy in Joules and tons of TNT. The two output arrays are the energy in Joules and tons of TNT.

- 3.0
- 6.0
- 9.1 (Indonesia earthquake, 2004)
- 9.2 (Alaska earthquake, 1964)
- 9.5 (Chile earthquake, 1960; largest ever measured)

Your function should also display to the screen a table with three columns of the data. The first column is the Richter scale measurement the second is the energy in Joules and the third column is the energy in tons of TNT. For the display make sure the data columns line up.

2. Create a rock, paper, scissors game using a Python function. (Just a reminder: Rock smashes scissors; scissors cut paper; paper covers rock.) The Python function is to be called “**RPSGame.py**” with no inputs and three outputs. The outputs in order are the number of wins, draws, and losses.
 - a. The function will randomly select from a list of the “weapons”. There are several ways to do this. One way is to use the random number generator (from the number guess game) and link it by index to a list of weapons. The computer’s “pick” should obviously not be printed.
 - b. A user will then be prompted to enter their weapon choice or “q” to quit.
 - c. Print the statement “rock, paper, scissors, GO!” or some other clever way to let the user know the game has begun.
 - d. Use if and print statements to declare the winner based on the choices by the computer and user. If both the computer and the user pick the same weapon, a tie should be called.
 - e. The game should automatically continue until someone (either the computer or the user) wins three times. Thus, counters are necessary.

- Translate the MATLAB “num_roman.m” function from the MATLAB homework assignment 3 into Python. The function should be called “**num_roman.py**” that converts integers between 1 and 3999 into Roman numerals. The input will be a scalar number and it should output a string that is the Roman numeral representation of the input number. The function should give a meaningful error message if the input is less than one. The function should truncate a fractional value to an integer. Different meaningful error messages should occur if you enter a value greater than 3999 or the value is not a scalar. If no input is entered it should return the Roman numeral for 2019.

For legitimate values the function should build up a string as follows where x is the input:
 while (x>=1000) subtract 1000 from x and concatenate ‘M’ to the string
 if (x>=900) subtract 900 from x and concatenate ‘CM’ to the string
 if (x>=500) subtract 500 from x and concatenate ‘D’ to the string
 if (x>=400) subtract 400 from x and concatenate ‘CD’ to the string
 while (x>=100) subtract 100 from x and concatenate ‘C’ to the string
 if (x>=90) subtract 90 from x and concatenate ‘XC’ to the string
 if (x>=50) subtract 50 from x and concatenate ‘L’ to the string
 if (x>=40) subtract 40 from x and concatenate ‘XL’ to the string
 while (x>=10) subtract 10 from x and concatenate ‘X’ to the string
 if (x>=9) subtract 9 from x and concatenate ‘IX’ to the string
 if (x>=5) subtract 5 from x and concatenate ‘V’ to the string
 if (x>=4) subtract 4 from x and concatenate ‘IV’ to the string
 while (x>=1) subtract 1 from x and concatenate ‘I’ to the string

Concatenate means to add text to the end of a current string (no spaces!)

- Translate the MATLAB “Epieces.m” function from the MATLAB Exam into Python. Write a function called “**Epieces**” with two input arrays *x* and *y* with a variable number of array elements and three outputs. If the arrays are not the same length the function should output an error message. The first output is determined by the table, the second output is the average of the output array and the third output is the index number of the *x* input minimum. The function needs to check each *y* character and use the different equations listed in Table 1 to compute the first output. If the *i*th character in *y* is not A, B, C or D then the output array is 2 times the array index *i*.

Table 1 – Function Used for First Output and Input Type

Array Output Equation	y Character
$\tan^{-1}(x)$ output is in degrees	A
$\sqrt{1+x^2}$	B
(round to the higher integer x)!	C
$\text{Log}_2(x)$ (Log base 2)	D

Test input: **a,b,c = Epieces([-2,3,3.1,5,25], 'ABCDE')**

Test output: **a = [-63.4349488, 3.16227766, 24, 2.32192809, 8]**

b = -5.19014861357 c = 0