CSULB
CECS174

Project1

This assignment focuses on the design, implementation, and testing of a Python program to display information about the energy released by earthquakes.

Objectives:

1. To practice editing and running of the code
2. To start using programming for problem-solving
3. To practice basic input and output
4. To write and evaluate arithmetic expression in Python
5. To write a project report

The Problem definition

For each of the following Richter scale measurements, your program will perform the appropriate calculations and display the equivalent amount of energy in joules and in tons of exploded TNT:

- 1.0
- 5.0
- 9.1 (Indonesia earthquake, 2004)
- 9.2 (Alaska earthquake, 1964)
- 9.5 (Chile earthquake, 1960; largest ever measured)
- An entry of your choice

Your program will then prompt the user to enter a Richter scale measurement, accept a floating-point value representing that measurement, perform the appropriate calculations, and display the equivalent amount of energy in **joules** and in **tons** of exploded TNT for that user-selected value. Perform the calculations and output the result in a formatted way as in the image.

```
>>> ================================ RESTART ================================
>>>
Richter        Joules                    TNT
1          1995262.3149688789             0.00047687913837688307
5          1995262314968.8828            476.87913837688404
9.1        2.818382931264449e+18   673609687.2046962
9.2        3.981071705534953e+18   951498973.5982201
9.5        1.1220184543019653e+19 2681688466.3048882

Please enter a Richter scale value: 3.4
Richter scale value: 3.4
Equivalence in joules: 7943282347.242789
Equivalence in tons of TNT: 1.8984900447521007
>>>
```

Assignment Notes

The Richter scale is a way to quantify the magnitude of an earthquake using a base-10 logarithmic scale. The magnitude is defined as the logarithm of the ratio of the amplitude of waves measured by a seismograph to an arbitrarily small amplitude.
An earthquake that measures 5.0 on the Richter scale has a shaking amplitude 10 times larger than one that measures 4.0 and corresponds to a 31.6 times larger release of energy.
[Rephrased from Wikipedia]
The energy in joules released for a particular Richter scale measurement is given by:

Energy = $10^{(1.5 * \text{richter}) + 4.8}$

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

You can use the website http://www.convertalot.com/earthquake_power__calculator.html to check your work.

Things to remember:

1. The input function is used to accept a response from the user. The function takes a string (a sequence of characters between quotes) as a prompt to display to the user. It then waits until the user types a response, terminated by the user touching the Enter key. The function returns the user's entry as a string.
2. To process the user's entry from the input function as a numeric value, you need to use the float function.
   You can use it directly with the input function:
   user_entry = float (input("Your prompt here"))
   Or on two separate lines
   user_entry_str = input("Your prompt here")

user_entry_float = float (user_entry_str)

3. The print function is used to display combination of variables, values, and strings. Each item (parameter) must be separated by a comma. By default, all items in one print statement will be printed on a single line.
4. Python has many facilities to make output look nice. You can do simple alignment (as in the sample output) by placing strings of spaces (" ") of particular lengths in print statements. It will take some trial and error to get it to look better. You can use the escape sequence \t with some spaces.
   Alternatively, you can use some of the features described in the following links (better)
   https://scientificallysound.org/2016/10/17/python-print3/

Suggestions

1. *Solve the problem using pencil and paper first.* You cannot write a program until you have figured out how to solve the problem. This first step is best done collaboratively with another student. (However, once the discussion turns to Python specifics and the subsequent writing of Python, you must work on your own.)
2. Draw the flowchart that you think will represent your algorithm.
3. Use IDLE to create a new program:
4. Write a simple version of the program (perhaps one which calculates the joules for an earthquake of magnitude 1 on the Richter scale).
5. Run the program and track down any errors.
6. Cycle through the steps to incrementally develop your program:
   a. Edit your program to add new capabilities.
   b. Run the program and fix any errors.
7. Modify your flowchart to match the final version of your code.
8. Use Raptor or any other software to draw your flowchart.
9. Add useful comments to your code.
10. Download the project report template from the "Introduction and resources module", fill it up using instructions provided in it. Submit as a pdf.

Do not use anything that we did not cover in class. Except of the formatting and alignment of the output.
Do not use magic numbers.
Use constant variables to define numbers used in the equation

Points to Ponder

Your program is not required to process anything except a positive floating-point value as the user's response. However, it's interesting to run your program and enter invalid responses:

1. What happens if you enter a negative number at the prompt?
2. What happens if you enter a letter instead of a number at the prompt?