HW10-PART2 (70 POINTS)

These instructions are applicable for all scripts that you will write in python3.

```
Instructions for Python3 Homework submission

#class header

#Q1
var1=124

#Q2
var2=3+var1
```

```
HW10-part2 is due Sunday April 14th 11:59pm

If you submit it by Saturday April 13th 11:59pm you will get 5 extra credit
points
```

Policy: Work on the HW problems on your own. It is not allowed to share code in any way. The use of chatGPT is not allowed. Using the internet to find out how to solve problems is not allowed.

General Grading rules we will follow:

- We do not give points for instructions but take points off for not following them.
- We take all points off for a question if your code has syntax errors (comment out the code for partial credit).
- We grade the code, not the output of the code. Even if the output is correct, hard-cording, redundant logic, code that has no purpose in the program will not earn full credits.
- We will take points off if you use out-of-class material.
- We will take points off if you do not follow directions when a question specifies to use a certain command or write the code in a certain way.

1. The provided data file **energy-sources.txt** contains information about energy consumption from various sources in the US during 2022. The data are taken from eia.gov. Each row represents a different energy source, along with its energy consumption measured in quadrillion British thermal units (Btu).

   Before starting this exercise, examine the provided dataset.

   Loops and comprehensions should not be used in this HW.
   Use pandas, and Matplotlib.

   In a script called **ex10-sources.py:**

Q1 (10) Read in the dataset and store the data in a DataFrame. Print the DataFrame to screen.

```
                    source    energy  renewable
0                Geothermal   0.21088       True
1                     Solar   1.87276       True
2                      Wind   3.82020       True
3              Biomass waste   0.39540       True
4                   Biofuels   2.37240       True
5                      Wood   2.10880       True
6              Hydroelectric   2.36840       True
7                 Petroleum  36.14760      False
8   Nuclear electric power   8.03280      False
9                      Coal  10.04100      False
10              Natural gas  33.13230      False
```

Q2 (8) Calculate the total energy consumption and print this formatted text:

```
In 2022, total U.S. energy consumption was equal to 100.5 quadrillion Btu.
```

Q3 (10) Add a new column to the DataFrame containing the percentage contribution of each energy source. Name the column *percentage.* Print the updated DataFrame to screen.

To calculate the percentage contribution of each energy source, you can use the following formula:

$$\text{Percentage Contribution} = (\text{Energy Source}/\text{Total Energy}) \times 100$$

	source	energy	renewable	percentage
0	Geothermal	0.21088	True	0.209826
1	Solar	1.87276	True	1.863396
2	Wind	3.82020	True	3.801098
3	Biomass waste	0.39540	True	0.393423
4	Biofuels	2.37240	True	2.360537
5	Wood	2.10880	True	2.098255
6	Hydroelectric	2.36840	True	2.356557
7	Petroleum	36.14760	False	35.966852
8	Nuclear electric power	8.03280	False	7.992634
9	Coal	10.04100	False	9.990792
10	Natural gas	33.13230	False	32.966630

Q4 (10) Calculate the total percentage contribution of both renewable and non-renewable energy to the overall energy consumption. Print to screen this formatted text:

```
Renewable energy contributes to 13.08%
Non-renewable energy contributes to 86.92%
```

Q5 (16) Create a new dataframe containing non-renewable energy sources along with the overall contribution (sum) of renewable energy sources.

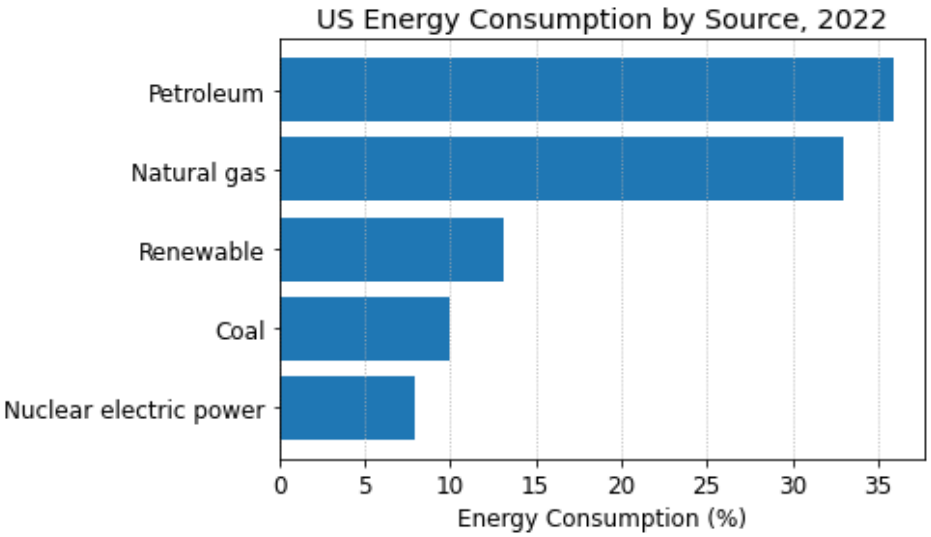
	source	percentage
0	Petroleum	35.966852
1	Nuclear electric power	7.992634
2	Coal	9.990792
3	Natural gas	32.966630
4	Renewable	13.083092

The last row specifically reports the overall renewable percentage.

Hint: make a DataFrame containing the non-renewable sources, and a DataFrame containing the overall renewable sources and concatenate them.

Q6 (16) Use the DataFrame created in Q5, and make this bar graph, which reports the different sources in descending order according to percentage values.
You should first sort the DataFrame and then make a bar graph.

Set the font size to 12, figure size (6,4), label the x axis, make the title, and the grid are reported in the figure below.



Upload to Gradescope HW10-part2:
ex10-sources.py