

## PLEASE USE PYCHARM WHEN SOLVING THESE EXERCISES

Below, a small routine is given for calculating prime numbers between 2 and 100. Rewrite this routine with list comprehensions and print out the primes list. (Hint: Use two comprehensions, one for "noprimers" and one for "primes" list)

```
In [ ]: noprimers=[]
        primes=[]
        for i in range(2, 8):
            for j in range(i*2, 101, i):
                noprimers.append(j)

        for k in range(2,101):
            if (k not in noprimers):
                primes.append(k)
        print(primes)
```

Here is a list of temperatures in Celsius scale, [-32.2,45.3,0.2,-40.0, 1.0, 50.8].

- First, using a list comprehension, convert the list to Fahrenheit scale
- Second, do the same using lambda function

Change the strings to floats in the list given below and print out the same list with floats. (Hint: use a nested list comprehension)

```
[['30', '12', '5.0', '321.3', '67', '77'], ['11', '22', '20.6', '20.89'], ['45', '0.02']]
```

Using a nested list comprehension convert first list to the second:

1<sup>st</sup> list:

```
[['30', '-5.0', '321.3', '77'], ['0.89'], ['45', '0.02']]
```

2<sup>nd</sup> list:

```
[['3', '0'], ['-', '5', '!', '0'], ['3', '2', '1', '!', '3'], ['7', '7']], [['0', '!', '8', '9']], [['4', '5'], ['0', '!', '0', '2']]]
```

Using a list comprehension, find the numbers that are divisible by 3, 5, 7, 11 from 1 to 10000

Write the same comprehension using lambda function. Hint 1: Search how to use filter function in connection with lambda function.

Write a lambda function for argument "t" where the arithmetic expression is (-2t) if t>=4 and (2t) for everything else. Evaluate the expression in the range 0 to 6

## In this example we will write to a file and read from the same file using list comprehension

- Write the following string to a file: 'Batteries have changed a lot in the past century, but there is still work to do.'
- Close the file.
- Read the file using a list comprehension to obtain the output below. (Hint: use split function)

```
[['Batteries', 'have', 'changed', 'a', 'lot', 'in', 'the', 'past', 'century,', 'but', 'there', 'is', 'still', 'work', 'to', 'do.']]
```

## A file object has a `writelines()` method which expects a list of strings. Search the web for how to use this method.

- Using `writelines` file object method and a list comprehension to write the even numbers from 0 to 100 to file.
- Each number should be on a new line
- You write this script in two lines of code

## File objects are useful for passing into other libraries that know how to use them. The built-in `csv` (comma separated values) module is a great example. In this exercise you will use `DictReader` class from `csv` package. Search the web on how to use `DictReader` object.

- You will find `fbi_crime_statistics.csv` file in the GitHub repo. Read this file and pass it to a `DictReader` object.
- Using a `for` loop read the rows with fieldnames "Violent crime" and "Population". At each iteration, pass the values under the given field names to integer variables
- Using the integer variables, calculate ratio (violent crimes/population) and print out this ratio for each year (year is another fieldname in the input file) Hint: By default the numbers in the rows will be read as strings. Also be careful about the commas in the numbers

## Write a short script to calculate and print out the circumference and area of a circle with only diameter as input. You can use `math` module which includes constant `pi`. For circumference and area calculations develop 2 functions.

- First develop the code to read the diameter interactively (input via keyboard) and print the results to screen. Hint: Interactive input is read as a string
- Second, change the code to read the diameter from a file and print the results to screen as well as to an output file. Hint: `file.write()` method accepts a string

## You developed a python code including functions to calculate circumference and area of a circle. Now, divide the code into 2 different parts:

- First file should be a module that includes the functions.
- Second file should be the main python code that takes the input from a file and writes the results to both screen and an output file.

**Develop a short python script that calculates the shell area between a larger and a smaller circle.**

- The code will read an input file that contains the diameter of the large and small circle. The input includes many sets of large&small circle radii.
- The code will have one main script and a module file. The main script will do the reading, writing and calling the module functions. The module file will contain the calculator for the shell area
- The code will write the output to both screen and an output file
- Your input file should look like this:

```
6 4
3.3 5.6
2 9
3.1 4.4
6 5
9 11.2
```

**Write a python module that includes a function to calculate the average of a given list of numbers.**

- The module function should ask you to enter numbers interactively
- The module function should print out the average of the given list
- Use the module function by calling it from another python script
- Modify the module to make sure that the module can be used just by itself (i.e. by simply running the module)