Practice Exam Scientific Programming 1

Name:
....

- This is a digital exam. The exam consists of 4 assignments in which you have to write a short python program.
- You will be making this exam in the online editor that is linked on the course website.
- Use one file for all solutions called `sp1_exam_practice.py`. This file is already opened in the online exam editor.
- This is a open-book exam, meaning you can use the course website as a recource. Keep in mind that:
    - you're not allowed to use any other webpage,
    - you're not allowed to use any existing code you've written before this exam,
    - and you cannot get any help with programming during the exam.
- You're only evaluated based on the *correctness* of your solutions, code design is not important. So, **you don't have to worry about comments or style guides**.
- You're not allowed to use `numpy`, `csv` or any other external Python module.
- **When you're done, go to the teacher with your student card or ID to mark your work as done before leaving the exam venue.**

1 Bounce

Write a Python function named `bounce(n)`. The function produces a sequence of numbers. This sequence starts with the number 1.0 and follows a pattern where it multiplies each number by 4 until it reaches a value of 100 or higher, after this it divides the number by 2 until it reaches a value lower than 2. This process continues based on the specified count n, alternating between multiplication by 4 and division by 2 to create a list of length n.

Example usage:

```
print(bounce(20))
```

Expected output:

```
[1.0, 4.0, 16.0, 64.0, 256.0, 128.0, 64.0, 32.0, 16.0, 8.0,
4.0, 2.0, 1.0, 4.0, 16.0, 64.0, 256.0, 128.0, 64.0, 32.0]
```

2 Swap

Create a Python function called `swap_words(text)` that takes a string `text` as its parameter. The function goes over all the words in the text and returns a string where the first word of the input is swapped with the second, the third is swapped with the fourth, etc. If the input text contains an odd number of words, the last word of the text will not be swapped with anything.

Example usage:

```
print(swap_words("Why is a raven like a writing desk?"))
print(swap_words("You can always take more than nothing."))
```

Example output:

```
is Why raven a a like desk? writing
can You take always than more nothing.
```

3 Gregory-Leibniz

The Gregory-Leibniz series is a way to approximate π.

The series follows this pattern:

- $\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \frac{4}{13} - \frac{4}{15} \cdots$
- So the series alternates between addition and subtraction of a term that gets smaller every step.
    - Step 1: take 4
    - Step 2: subtract $\frac{4}{3}$
    - Step 3: add $\frac{4}{5}$
    - Step 4: subtract $\frac{4}{7}$
    - etc. (the divisor increases by 2 at each step).

Create a function `gregory_leibniz(n)`, that approximates π by `n` number of steps.

Example usage:

```
print(gregory_leibniz(1))
print(gregory_leibniz(10))
print(gregory_leibniz(1000000))
```

Expected output:

```
4.0
3.0418396189294032
3.1415916535897743
```

4 Home advantage

For this assignment you need to download the files `barca.txt` and `barca_short.txt`. This contains the results for football matches of F.C. Barcelona (from seasons 11/12 to 13/14). The file contains the following data:

```
29/08/11,Villarreal,won,5,0,home
10/09/11,Sociedad,draw,2,2,away
17/09/11,Osasuna,won,8,0,home
...
03/05/14,Getafe,draw,2,2,home
11/05/14,Elche,draw,0,0,away
17/05/14,Ath Madrid,draw,1,1,home
```

As you can see, the data fields are separated by a comma and contain the following information:

1. Date of the match
2. The opponent
3. The result: won/lost/draw
4. The number of goals for Barcelona
5. The number of goals for the opponent
6. The location: away/home

Playing at home is considered an advantage for any football club. Let's see if this is true for Barcelona. Write a function `home_advantage(filename)`. This function computes the difference between the amount of home matches won and the amount of away matches won. (So, a positive number means that more home matches were won than away matches.)

Example usage 1:

```
advantage = home_advantage('barca_short.txt')
print(advantage)
```

Expected output:

```
2
```

Example usage 2:

```
advantage = home_advantage('barca.txt')
print(advantage)
```

Expected output:

```
15
```

Tips:

1. You can load files using: `input_file = open(filename, 'r')`
2. Don't forget to close the file: `input_file.close()`