1. **What is FOR loop?**

You have a ***positive*** integer number **N** as an input. Please write a program in Python 3 that calculates the sum in range 1 and N.

***Limitations:***

N <= 10^25;

Execution time: 0.1 seconds.

***Examples:***

Input: 1  
Output: 1  
  
Input: 3  
Output: 6  
  
Input 10:

Output: 55

1. **Counting islands**

You have a matrix MxN that represents a map. There are 2 possible states on the map: 1 - islands, 0 - ocean. Your task is to calculate the number of islands in the most effective way. Please write code in Python 3.  
  
***Inputs:***

***M N  
Matrix***

***Examples:***

Input:

3 3  
0 1 0  
0 0 0  
0 1 1  
Output: 2  
  
Input:  
3 4   
0 0 0 1  
0 0 1 0  
0 1 0 0  
Output: 3  
  
Input:  
3 4  
0 0 0 1  
0 0 1 1  
0 1 0 1  
Output: 2

1. **Regression on the tabular data**

You have a dataset (internship\_train.csv) that contains 53 anonymized features and a target column. Your task is to build model that predicts a target based on the proposed features. Please provide predictions for internship\_hidden\_test.csv file. Target metric is **RMSE**. The main goal is to provide github repository that contains:

* jupyter notebook with analysis;
* code for modeling (Python 3);
* file with model predictions;
* readme file;
* requirements.txt file.

1. **Soil erosion detection**

Here is one of the open problems in Quantum. Soil erosion is a really unwanted process that spoils huge areas of fertile land. Your task is to train model for erosion detection.

***What do you have***

* Sentinel2 tile (T36UXV\_20200406T083559\_TCI\_10m.jp2);
* Masks with soil erosion for this tile (masks directory);

***What should we get***

As usual it should be github repository that contains:

* jupyter notebook with data analysis;
* script for model training (preferably tf.keras);
* readme file;
* requirements.txt file;
* ***solution report.*** This is the most important part. We expect here not only solution description but also your proposals and result of research in different papers about soil erosion detection problem. In other words - what can help us to solve problem in the most effective way.

Some initial knowledge about aerial imagery processing you can find here:  
<https://medium.datadriveninvestor.com/preparing-aerial-imagery-for-crop-classification-ce05d3601c68>