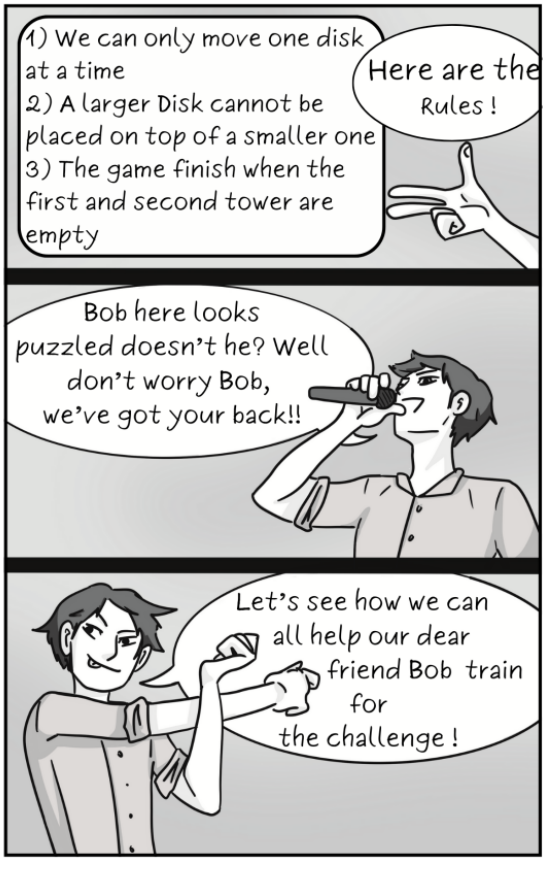
The Hanoi Tower



The Tower of Hanoi is a classic mathematical puzzle invented by Édouard Lucas in 1883.

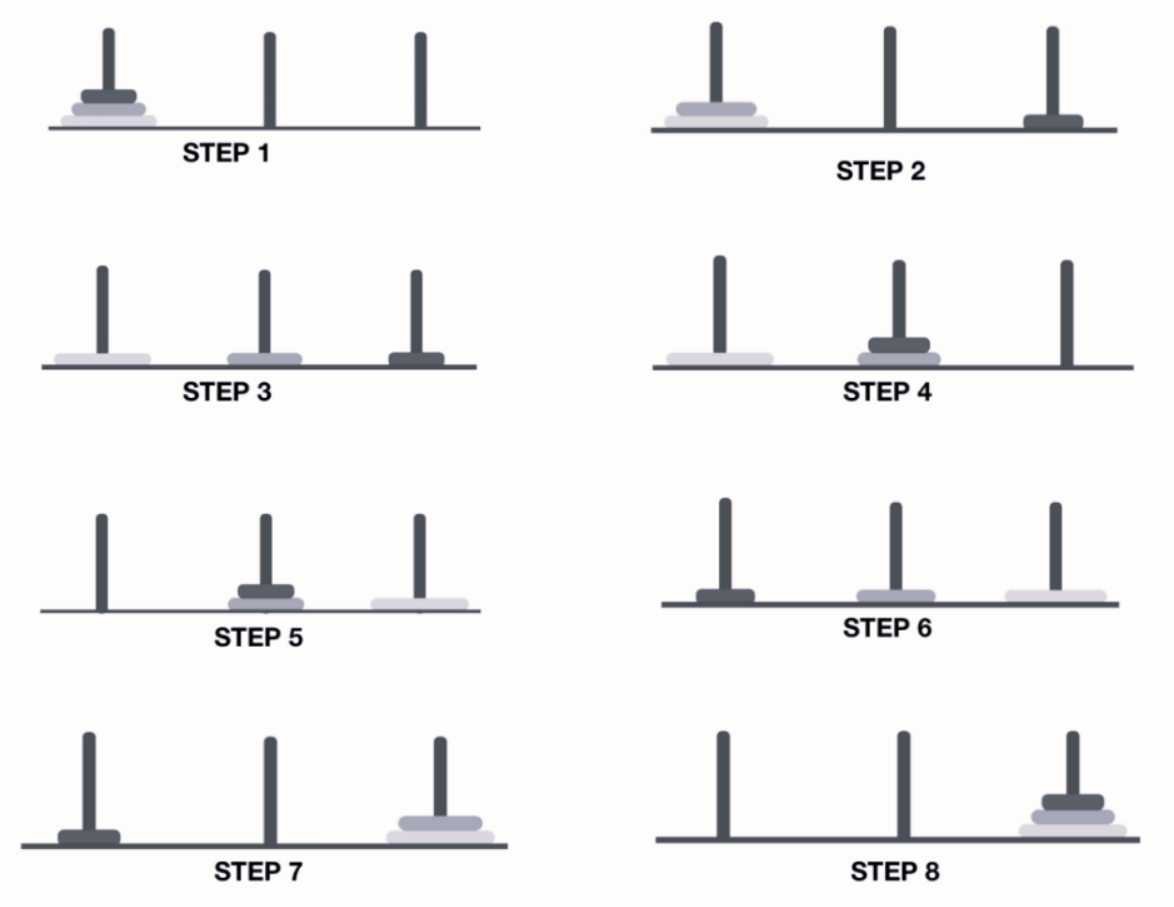
It consists of three rods and a set of different-sized disks placed on one rod. The objective is to move all the disks to another rod, while respecting 3 simples rules:

- We can only move one disk at a time
- A larger disk cannot be placed on a smaller one
- The game is finished when the tower is entirely reconstructed on the third rod

Solving the puzzle will require multiple methods (iterative/recursive) and as the complexity grows exponentially with the number of disks an algorithmic approach will be essential.

If you want more information you can find some here :

https://en.wikipedia.org/wiki/Tower_of_Hanoi



This project will focus on the development of the towers in python as a playable game.

The goal for you is to go the furthest possible during the assigned time. We made multiple tasks to help you in the development, some will be necessary to obtain a playable game and some will be considered as options.

Be careful and frequently test your code to ensure its accuracy !

Try to maintain a clear code with comments and a good structure (maybe using multiple files can help you.)

First Task

First we have to create a function that will be able to generate and initialize the board for a number of disks given (n).

We recommend representing the board with a list of lists ([[ ] , [ ] , [ ]]) where each list will be one of the towers.

For the initialization we will add the disks in the first tower. We consider 1 the smallest disk and n the largest.

The number of disks need to be modulable as hanoi tower can be playable for any number of disks given.

Second Task

To progress correctly we need to be able to display the towers at any given moment. So we need to create a function that will display the board given the towers. We can start with something very basic :

[3,2,1]

[ ]

[ ]

And then try to embellish it with for example a real representation of the board in the terminal :

```
                  4
         1        5
3        2        6
_________________________
```

Third Task

Create a function that will execute a move in the towers based on a source tower and a destination tower, but only if the move respects the rules of the game, else ask for another one until the move can be executed.

Create a function that will check if the game is over (if the disks are all rightfully placed on the last tower).

Fourth Task

Create the main function that will let the user be able to play the game entirely. The player must be able to choose the number of disks he wants to play with, he also needs to be able to abort the last move he made and quit at any moment.

hint for the cancellation of the last move : you will need to store the moves somewhere to be able to remember them at the next step, maybe a list?

Fifth Task

Add a demonstration option that will integrate the recursive and/or iterative resolution of hanoi.

If you want more information you can find some here :

https://en.wikipedia.org/wiki/Tower_of_Hanoi

Options

Once you've done all that you will have a playable game, but it can be interesting to add some options for the gameplay:

- Limitation in the number of moves (limit the number of moves to create more challenge in the resolution of the game. if the player attain that number he loses)
- Register the duration of the game (maybe in a file ?)
- Calculate a score considering the duration of the game and the number of moves made
- create an option to store, access and show the best scores with the information of the game

If you are satisfied with all of that but still want to explore more the game you can try to upgrade the visual representation of the game (turtle library can be a good start). Your teacher will be able to give you more information on visual representation and library usages.