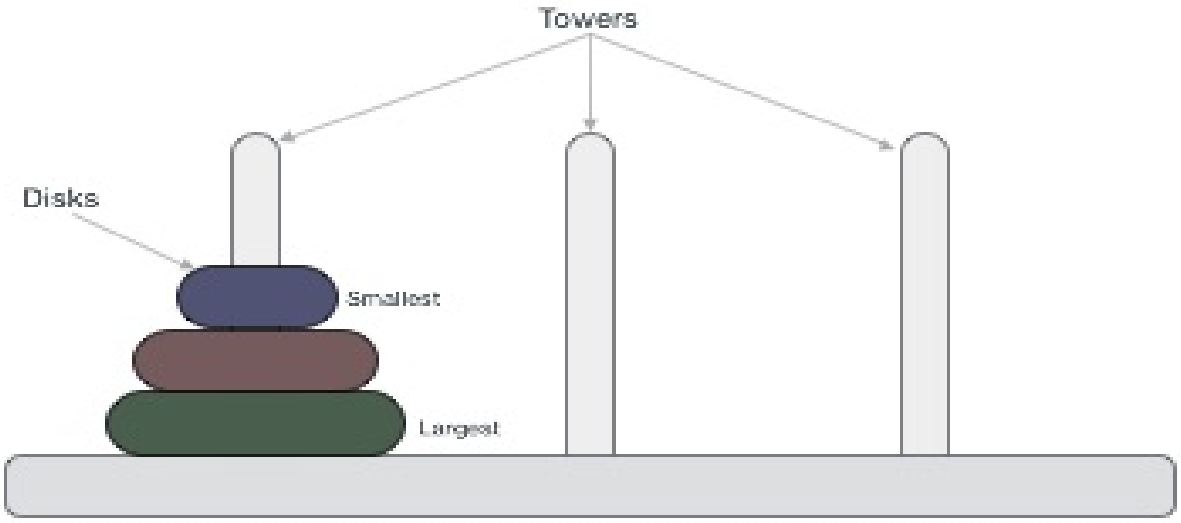
Tower of Hanoi

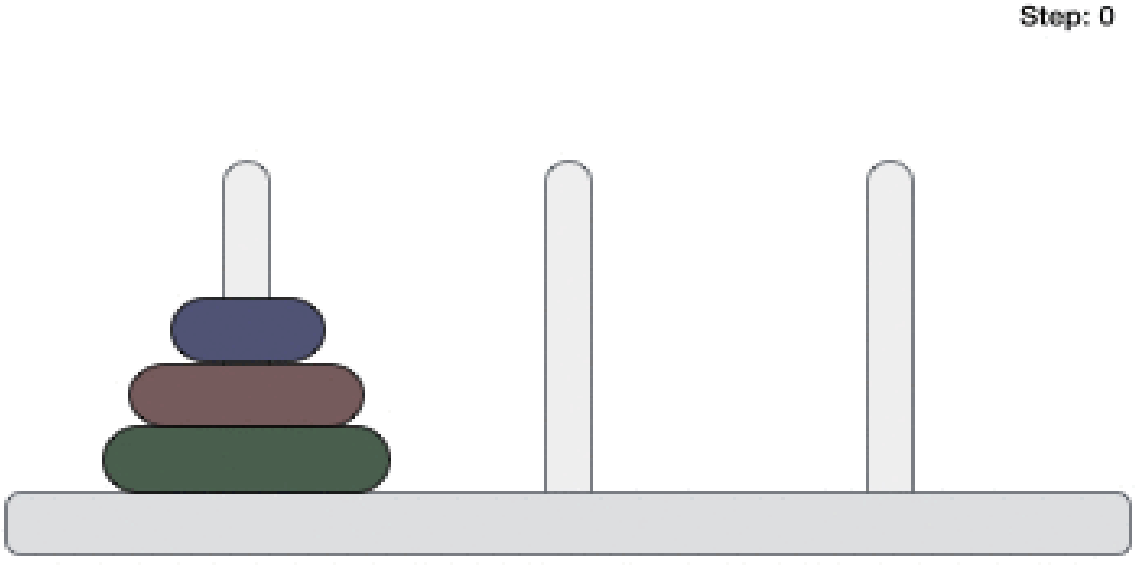
Tower of Hanoi is a mathematical puzzle, invented by the French mathematician Edouard Lucas in 1883, where we have three rods and n disks. This puzzle is used to move the entire stack to another rod and it is just a fun problem.

There are three rods, Source(A), Helper(B) and Destination(C). Rod A is a source rod containing a set of disks stacked to resemble a tower, with the largest disk at the bottom and the smallest at top. Rod B, which is a helper rod helps to pass the disks from source to destination. Rod C is the destination where finally the disks will be visible or stacked like rod A initially.

Obeying the following rules:

1. Only one disk can be transferred at a time.
2. Each move consists of taking the upper disk from one of the rod and placing it on the top of another peg i.e. a disk can only be moved if it is the uppermost disk of the rod.
3. Never a larger disk is placed on a smaller disk during the transfer.



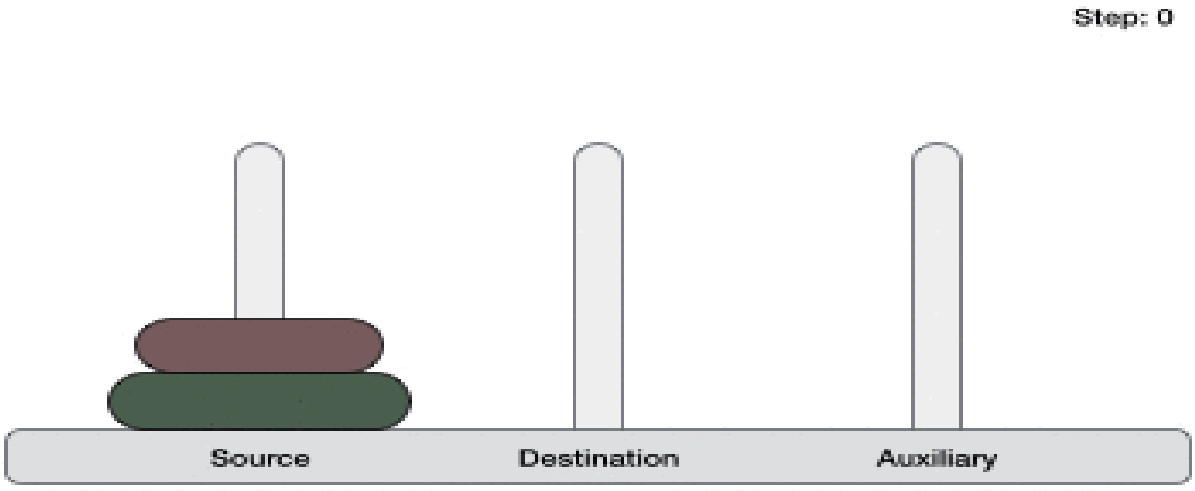


Algorithm :

For writing an algorithm for Tower of Hanoi we need to write an algo for a smaller number of disks like 1 or 2. We mark three towers with name, source, destination and aux/helper (only to help moving the disks). If we have only one disk, then it can easily be moved from source to destination peg.

If we have 2 disks:

- First, we move the smaller(top) from source to auxillary rod.
- Then , we move the larger disk from source to destination rod.
- And finally, we move the smaller disk from auxiliary to destination.



Now, we make an general algorithm if we nn number of disks then what should we do:

Step 1: Move n-1 disks from source to auxiliary.
Step 2: Move nth disk from source to destination.
Step 3: Move n-1 disks from auxiliary to destination.

A recursive approach for solving Tower of Hanoi :

```
Start
Procedure HanoiTower(disk, src, dest, helper)
        if(disk == 0) , Then
                return
        else
        HanoiTower(disk-1,src,helper,dest)        //step 1
        Move disk from src to dest                //step2
        HanoiTower(disk-1,helper,dest,src)        //step 3

        END

STOP
```

CODE FOR TOWER OF HANOI:

TowerofHanoi.c++

```cpp
# include <iostream>
using namespace std;

void HanoiTower(int n, char src, char dest, char helper)
{

    if(n==0)    //base case
    {
        return;
    }
    HanoiTower(n-1,src,helper,dest);
    cout<<"Mover from "<< src <<" to "<<dest<<endl;
    HanoiTower(n-1,helper,dest,src);
}

int main()
{
    HanoiTower(5,'A','C','B');
    return 0;
}
```

Output :

```
Move from A to C
Move from A to B
Move from C to B
Move from A to C
Move from B to A
Move from B to C
Move from A to C
```