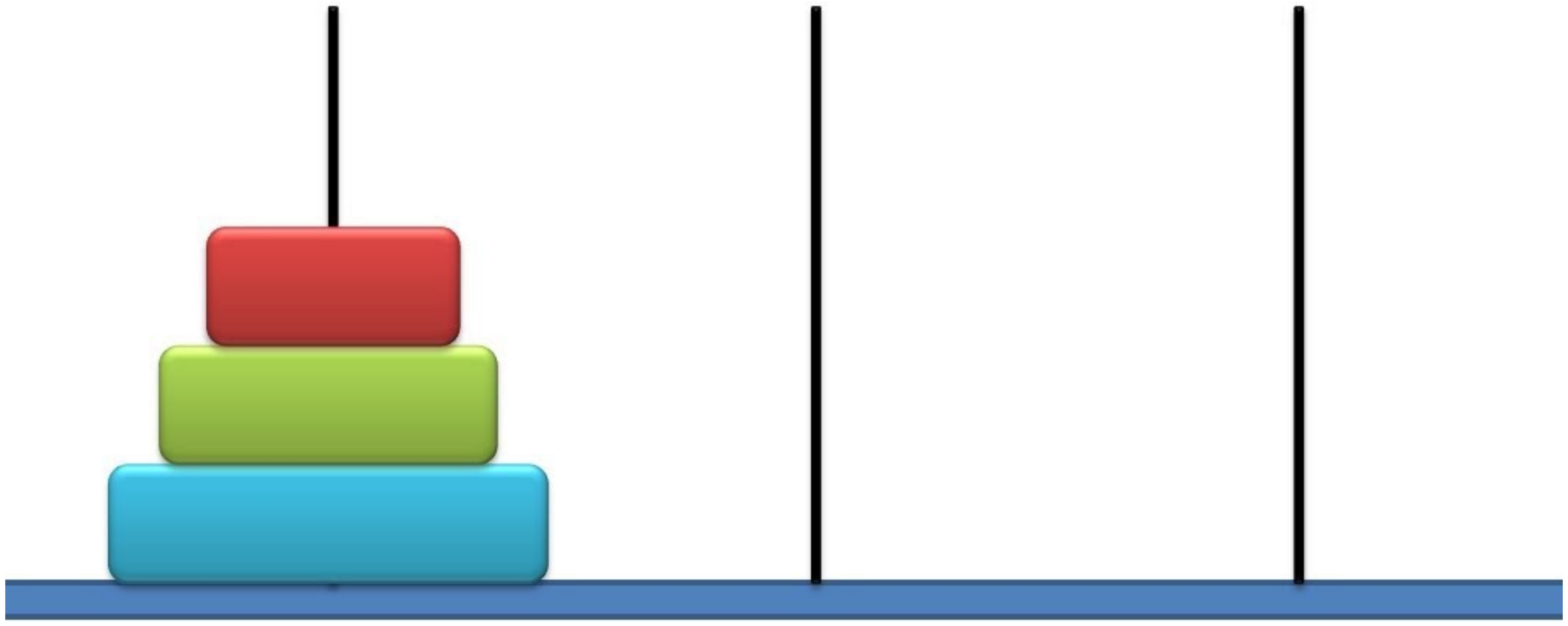
Tower Of Hanoi



About Tower of Hanoi

- Tower of Hanoi is a very famous game.
- In this game there are **3 pegs** and **N number of disks** placed one over the other in decreasing size.
- The objective of this game is to move the disks **one by one** from the first peg to the last peg.
- And there is only **ONE** condition, we can not place a bigger disk on top of a smaller disk.

How to solve Tower Of Hanoi?

- To solve this game we will follow 3 simple steps recursively.
- We will use a general notation:

  T(N, Beg, Aux, End)
  T denotes our procedure
  N denotes the number of disks
  Beg is the initial peg
  Aux is the auxiliary peg
  End is the final peg

Steps

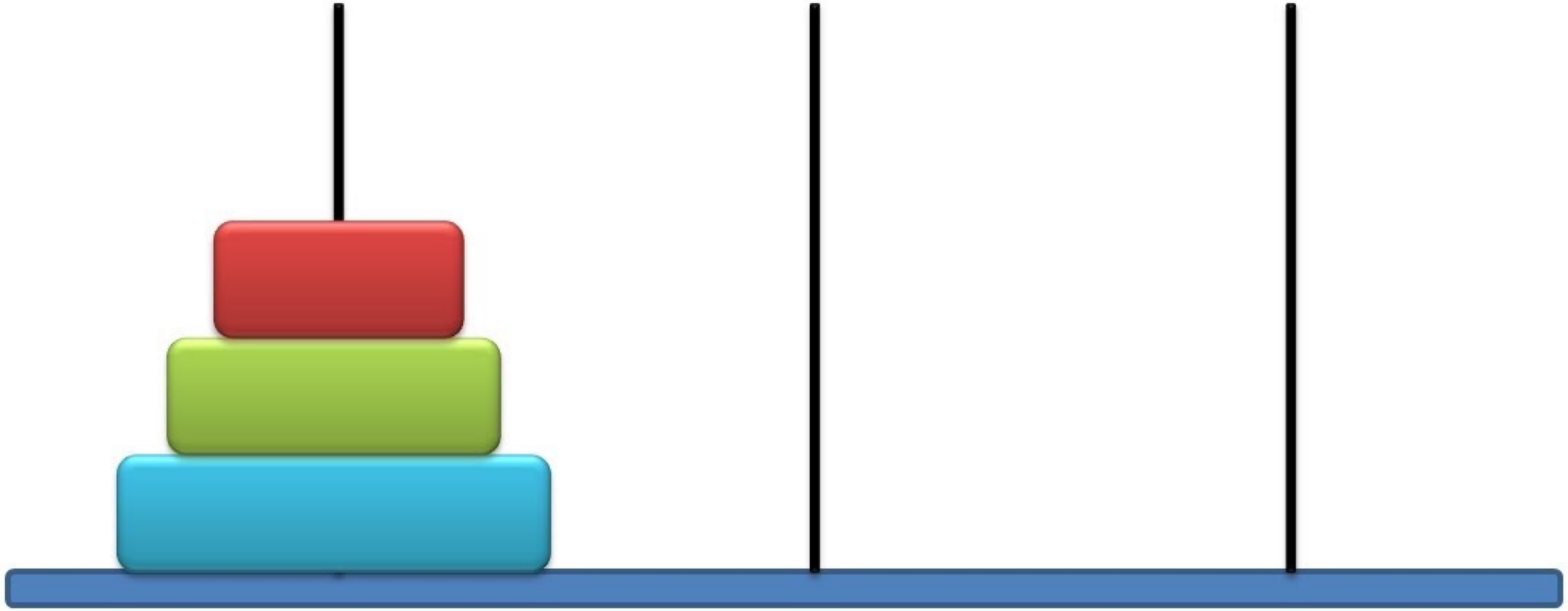
1. **T(N-1, Beg, End, Aux)**
2. **T(1, Beg, Aux, End)**
3. **T(N-1, Aux, Beg, End)**

Step 1 says: Move top (N-1) disks from **Beg** to **Aux** peg.

Step 2 says: Move 1 disk from **Beg** to **End** peg.

Step 3 says: Move top (N-1) disks from **Aux** to **End** peg.

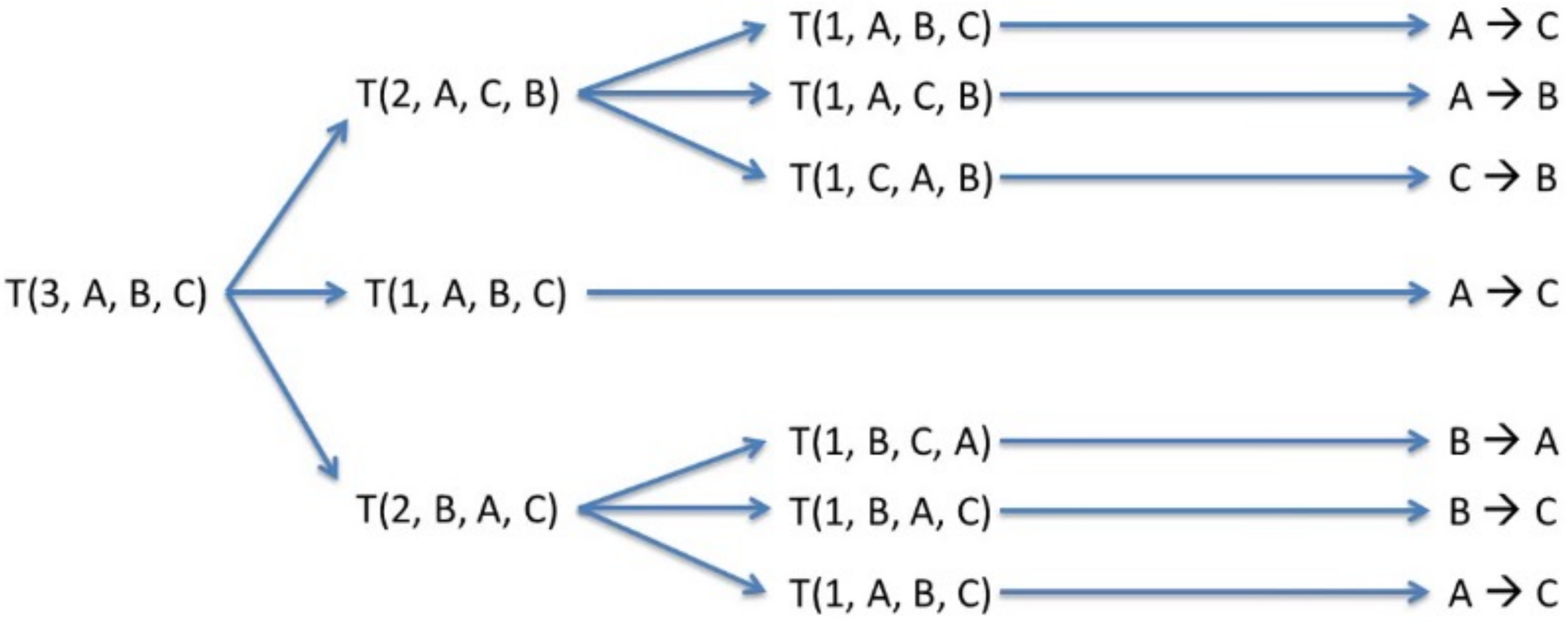
Take 3 Disks for Example



Take 3 Disks for Example

- We have 3 disks Red, Green and Blue all placed in peg A
- So, **N = 3** (Number of disks)
- Therefore, we will start with **T(3, A, B, C)**

Take 3 Disks for Example



Moves

A → C

A → B

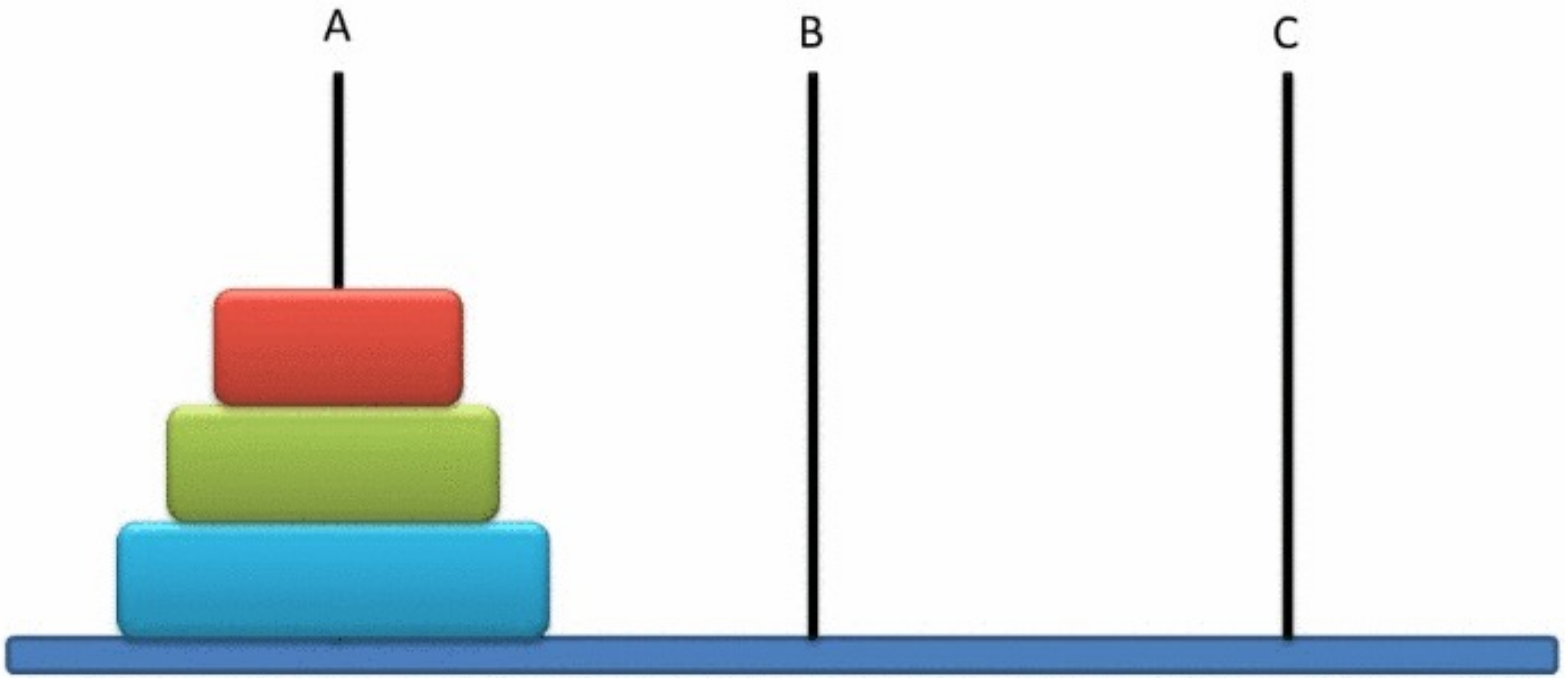
C → B

A → C

B → A

B → C

A → C



Algorithm

```
/*
N = Number of disks
Beg, Aux, End are the pegs
*/
T(N, Beg, Aux, End)
Begin
   if N = 1 then
      Print: Beg --> End;
   else
      Call T(N-1, Beg, End, Aux);
      Call T(1, Beg, Aux, End);
      Call T(N-1, Aux, Beg, End);
   endif
End
```

Moves required

- If there are N disks then we can solve the game in minimum $2^N - 1$ moves.
- Example: N = 3 Minimum moves required = $2^3 - 1 = 7$