

## Towers of Hanoi: Quick Overview

Based on: <https://www.geeksforgeeks.org/c-program-for-tower-of-hanoi/>

The "Towers of Hanoi" is a mathematical puzzle where one has three pegs and  $n$  disks and the goal is to move the entire stack of disks to another rod, obeying the following rules:

- Only one disk may be moved at a time
- Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack: a disk can only be moved if it is the uppermost disk on a stack.
- No disk may be placed on top of a smaller disk

### Solution

Take an example for 2 disks :

Let peg 1 = 'A', peg 2 = 'B', peg 3 = 'C'.

Step 1: Shift first disk from 'A' to 'B'.

Step 2: Shift second disk from 'A' to 'C'.

Step 3: Shift first disk from 'B' to 'C'.

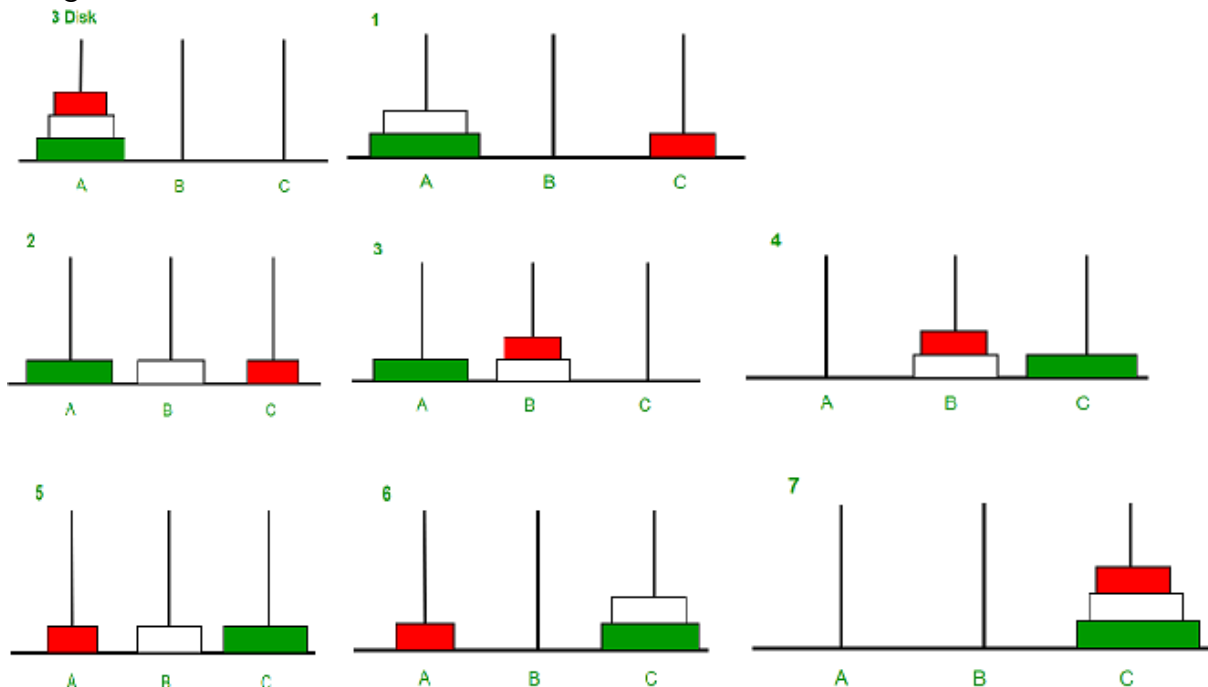
The solution pattern is:

Shift ' $n-1$ ' disks from 'A' to 'B'.

Shift last disk from 'A' to 'C'.

Shift ' $n-1$ ' disks from 'B' to 'C'.

Image illustration for 3 disks:



Input: 2

Output:

- Disk 1 moved from A to B
- Disk 2 moved from A to C
- Disk 1 moved from B to C

Input: 3

Output:

- Disk 1 moved from A to C
- Disk 2 moved from A to B
- Disk 1 moved from C to B
- Disk 3 moved from A to C
- Disk 1 moved from B to A
- Disk 2 moved from B to C
- Disk 1 moved from A to C

Code Solution in C++

```
#include <stdio.h>

// C recursive function to solve tower of hanoi puzzle
void towerOfHanoi(int n, char from_rod, char to_rod, char aux_rod)
{
    if (n == 1)
    {
        printf("\n Move disk 1 from rod %c to rod %c", from_rod, to_rod);
        return;
    }
    towerOfHanoi(n-1, from_rod, aux_rod, to_rod);
    printf("\n Move disk %d from rod %c to rod %c", n, from_rod, to_rod);
    towerOfHanoi(n-1, aux_rod, to_rod, from_rod);
}

int main()
{
    int n = 4; // Number of disks
    towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C are names of rods
    return 0;
}
```

**Output:**

```
Move disk 1 from rod A to rod B
Move disk 2 from rod A to rod C
Move disk 1 from rod B to rod C
Move disk 3 from rod A to rod B
Move disk 1 from rod C to rod A
Move disk 2 from rod C to rod B
Move disk 1 from rod A to rod B
Move disk 4 from rod A to rod C
Move disk 1 from rod B to rod C
```

Move disk 2 from rod B to rod A  
Move disk 1 from rod C to rod A  
Move disk 3 from rod B to rod C  
Move disk 1 from rod A to rod B  
Move disk 2 from rod A to rod C  
Move disk 1 from rod B to rod C