Tower of Hanoi

The tower of Hanoi is a famous puzzle where we have three rods and N disks. The objective of the puzzle is to move the entire stack to another rod. You are given the number of discs N. Initially, these discs are in the rod 1. You need to print all the steps of disc movement so that all the discs reach the 3rd rod. Also, you need to find the total moves.

Note: The discs are arranged such that the top disc is numbered 1 and the bottom-most disc is numbered N. Also, all the discs have different sizes and a bigger disc cannot be put on the top of a smaller disc.

Example 1:

Input:

N = 2

Output:

move disk 1 from rod 1 to rod 2

move disk 2 from rod 1 to rod 3

move disk 1 from rod 2 to rod 3

Total number of moves are: 3

Explanation: For N=2 , steps will be as follows in the example and total 3 steps will be taken.

Example 2:

Input:

N = 3

Output:

move disk 1 from rod 1 to rod 3

move disk 2 from rod 1 to rod 2

move disk 1 from rod 3 to rod 2

move disk 3 from rod 1 to rod 3

move disk 1 from rod 2 to rod 1

move disk 2 from rod 2 to rod 3

move disk 1 from rod 1 to rod 3

Total number of moves are: 7

Explanation: For N=3, steps will be as follows in the example and total 7 steps will be taken.

Constraints:

1 <= N <= 16

Expected Time Complexity: O(2^N)

Expected Auxiliary Space: O(N)

CODE:

```
#include <bits/stdc++.h>
using namespace std;
int cnt = 0;

void toh(int s, int d, int h, int n)
{
    cnt++;
    if (n == 1)
    {
        cout << "move disk " << n << " from rod " << s << " to rod " << d << endl;
        return;
    }
    toh(s, h, d, n - 1);
    cout << "move disk " << n << " from rod " << s << " to rod " << d << endl;
    toh(h, d, s, n - 1);
}
```

```cpp
int main()
{
    int n;
    cin >> n;
    int s = 1, h = 2, d = 3;
    toh(s, d, h, n);
    cout << "Total number of moves are: " << cnt << endl;
    return 0;
}
```