# **LAB 1 - TOY PROBLEM**

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**Problem :**

Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:

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

**Solution (C++) :**

#include <bits/stdc++.h>

using namespace std;

void towerOfHanoi(int n, char from\_rod,

                    char to\_rod, char aux\_rod)

{

    if (n == 1)

    {

        cout << "Move disk 1 from rod " << from\_rod <<

                            " to rod " << to\_rod<<endl;

        return;

    }

    towerOfHanoi(n - 1, from\_rod, aux\_rod, to\_rod);

    cout << "Move disk " << n << " from rod " << from\_rod <<

                                " to rod " << to\_rod << endl;

    towerOfHanoi(n - 1, aux\_rod, to\_rod, from\_rod);

}

// Driver code

int main()

{

    int n = 4; // Number of disks

    towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C are names of rods

    return 0;

}

Output:

Tower of Hanoi Solution for 4 disks:

A: [4, 3, 2, 1] B: [] C: []

Move disk from rod A to rod B

A: [4, 3, 2] B: [1] C: []

Move disk from rod A to rod C

A: [4, 3] B: [1] C: [2]

Move disk from rod B to rod C

A: [4, 3] B: [] C: [2, 1]

Move disk from rod A to rod B

A: [4] B: [3] C: [2, 1]

Move disk from rod C to rod A

A: [4, 1] B: [3] C: [2]

Move disk from rod C to rod B

A: [4, 1] B: [3, 2] C: []

Move disk from rod A to rod B

A: [4] B: [3, 2, 1] C: []

Move disk from rod A to rod C

A: [] B: [3, 2, 1] C: [4]

Move disk from rod B to rod C

A: [] B: [3, 2] C: [4, 1]

Move disk from rod B to rod A

A: [2] B: [3] C: [4, 1]

Move disk from rod C to rod A

A: [2, 1] B: [3] C: [4]

Move disk from rod B to rod C

A: [2, 1] B: [] C: [4, 3]

Move disk from rod A to rod B

A: [2] B: [1] C: [4, 3]

Move disk from rod A to rod C

A: [] B: [1] C: [4, 3, 2]

Move disk from rod B to rod C

A: [] B: [] C: [4, 3, 2, 1]

1.What is a toy problem?

Ans : A toy problem is a problem that doesn't have all the complexity of a real-world engineering problem. It could be a simplified or shallow version of a more difficult and intricate problem.

2.How many approaches do you have for solving the toy problem which you have taken?

Ans : There are multiple approaches, the one used above is recursion. Other approaches involve iterative, non-recursive, binary etc.

3.Map your toy problem to any real life application.

Ans : The Tower of Hanoi is frequently used in psychological research on problem solving.

Github : https://github.com/komalrastogi02/AI-Lab.git