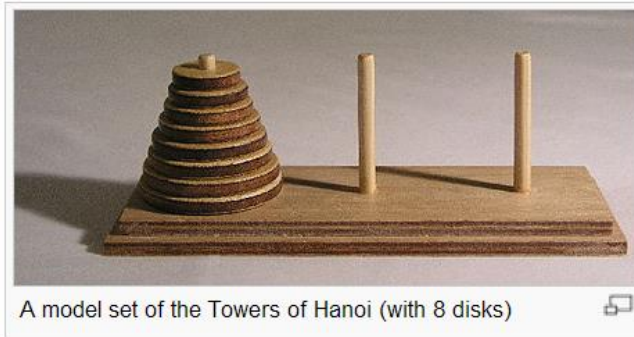# Homework 3: Tower of Hanoi

Introduction:

The **Tower of Hanoi** is a mathematical game or puzzle. It consists of three rods, and a number of disks of different sizes which can slide onto any rod. The puzzle starts with the disks in a neat stack in ascending order of size on one rod, the smallest at the top, thus making a conical shape. 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.

With three disks, the puzzle can be solved in seven moves. The minimum number of moves required to solve a Tower of Hanoi puzzle is $2^n - 1$, where n is the number of disks.

A model set of the Towers of Hanoi (with 8 disks)

Description:

In this homework you are asked to make a program to output all the $2^n - 1$ steps of the solution to a Tower of Hanoi with n disks and 3 rods, assuming that the rods are named after A, B and C, all the disks are initially located on the rod A in ascending order of size and the final destination is rod C.

Input:

The number of disks n.

Output:

All the $2^n - 1$ steps showing how to solve the Tower of Hanoi following the format:

Move disk on rod [A|B|C] to rod [A|B|C]

Sample Input:

3

Sample Output:

Move disk on rod A to rod C
Move disk on rod A to rod B
Move disk on rod C to rod B
Move disk on rod A to rod C
Move disk on rod B to rod A
Move disk on rod B to rod C
Move disk on rod A to rod C

Hint:

You can solve the problem moving n disks from rod A to rod C in a recursive way:

1. Move n−1 disks from A to B. This leaves disk n alone on peg A.
2. Move disk n from A to C.
3. Move n−1 disks from B to C so they sit on disk n.

Due Date:

See TA's webpage.

Reference:

The Tower of Hanoi on Wikipedia: http://en.wikipedia.org/wiki/Tower_of_Hanoi