Problem G

Tower of Hanoi

Time limit: 1 second
Memory limit: 1024 megabytes

Problem Description

河內塔是根據一個傳說形成的數學問題：

有三根杆子 A，B，C。A 杆上有 N 個 $(N > 1)$ 穿孔圓盤，盤的尺寸由下到上依次變小。要求按下列規則將所有圓盤移至 B 杆：

1. 每次只能移動一個圓盤。
2. 大盤不能疊在小盤上面。

現在有 N 個圓盤的河內塔，圓盤由小到大依序編號為 1 ~ N，請將所有圓盤皆在 A 杆，請將所有圓盤移到 B 杆，並將每個步驟輸出。

Input Format

多筆測資輸入。每筆測資輸入一個整數 N，代表有 N 個圓盤。$N = 0$時結束。

Output Format

輸出將所有圓盤從 A 移到 B 的步驟及總共移動的次數。每一步輸出兩行，第一行輸出第幾步 "Step t"，第二行輸出圓盤的移動方式，將編號 i 的圓盤從 X 杆移至 Y 杆，" Move disk i from rod X to rod Y."。接著間隔一個空白行輸出總共移動的次數 " Total moved k steps."。每筆測資以空白行隔開。輸出格式參考 Sample Output。

Technical Specification

- $0 \leq N \leq 15$

Sample Input 1

```
1
2
0
```

Sample Output 1

```
Step 1
Move disk 1 from rod A to rod B.

Total moved 1 steps.

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

Total moved 3 steps.
```

Sample Input 2

```
3
4
0
```

Sample Output 2

```
Step 1
Move disk 1 from rod A to rod B.
Step 2
Move disk 2 from rod A to rod C.
Step 3
Move disk 1 from rod B to rod C.
Step 4
Move disk 3 from rod A to rod B.
Step 5
Move disk 1 from rod C to rod A.
Step 6
Move disk 2 from rod C to rod B.
Step 7
Move disk 1 from rod A to rod B.

Total moved 7 steps.

Step 1
Move disk 1 from rod A to rod C.
Step 2
Move disk 2 from rod A to rod B.
Step 3
Move disk 1 from rod C to rod B.
Step 4
Move disk 3 from rod A to rod C.
Step 5
Move disk 1 from rod B to rod A.
Step 6
Move disk 2 from rod B to rod C.
Step 7
```

```
Move disk 1 from rod A to rod C.
Step 8
Move disk 4 from rod A to rod B.
Step 9
Move disk 1 from rod C to rod B.
Step 10
Move disk 2 from rod C to rod A.
Step 11
Move disk 1 from rod B to rod A.
Step 12
Move disk 3 from rod C to rod B.
Step 13
Move disk 1 from rod A to rod C.
Step 14
Move disk 2 from rod A to rod B.
Step 15
Move disk 1 from rod C to rod B.

Total moved 15 steps.
```

Pseudo Code

```
Function Hanoi(n, src, dest, spare):
    IF n == 0
        return
    ELSE
        Hanoi(n-1, src, spare, dest)
        // Move disk from src to dest
        Hanoi(n-1, spare, dest, src)
    END IF
```