UVa Online Judge

10017 The Never Ending Towers of Hanoi

In 1883, Edward Lucas invented, or perhaps reinvented, one of the most popular puzzles of all times – the Tower of Hanoi, as he called it – which is still used today in many computer science textbooks to demonstrate how to write a recursive algorithm or program. First of all, we will make a list of the rules of the puzzle:

- There are three pegs: `A`, `B` and `C`.
- There are n disks. The number n is constant while working the puzzle.
- All disks are different in size.
- The disks are initially stacked on peg `A` so that they increase in size from the top to the bottom.
- The goal of the puzzle is to transfer the entire tower from the `A` peg to the peg `C`.
- One disk at a time can be moved from the top of a stack either to an empty peg or to a peg with a larger disk than itself on the top of its stack.

Your job will be to write a program which will show a copy of the puzzle on the screen step by step, as you move the disks around. This program has to solve the problem in an efficient way.

TIP: It is well known and rather easy to prove that the minimum number of moves needed to complete the puzzle with n disks is $2^n - 1$.

Input

The input file will consist of a series of lines. Each line will contain two integers n, m. n, lying within the range $[1, 250]$, will denote the number of disks and m, belonging to $[0, 2^n - 1]$, will be the number of the last move, you may assume that m will also be less than 2^{16}, and you may also assume that a good algorithm will always have enough time. The file will end at a line formed by two zeros.

Output

The output will consist again of a series of lines, formatted as show below.

NOTES:

- There are 3 spaces between de '`=>`' and the first number printed. If there isn't any number, there should be no spaces.
- All the disks in a single peg are printed in a single line (not as in the Problem #1 below).
- Print a blank line after every problem.

Sample Input

```
64 2
8 45
0 0
```

Sample Output

```
Problem #1

A=>   64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3 2 1
B=>
C=>

A=>   64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3 2
B=>   1
C=>

A=>   64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3
B=>   1
C=>   2

Problem #2

A=>   8 7 6 5 4 3 2 1
B=>
C=>

A=>   8 7 6 5 4 3 2
B=>   1
C=>

A=>   8 7 6 5 4 3
B=>   1
C=>   2

A=>   8 7 6 5 4 3
B=>
C=>   2 1

A=>   8 7 6 5 4
B=>   3
C=>   2 1

A=>   8 7 6 5 4 1
B=>   3
C=>   2

A=>   8 7 6 5 4 1
B=>   3 2
C=>
```

```
A=>   8 7 6 5 4
B=>   3 2 1
C=>

A=>   8 7 6 5
B=>   3 2 1
C=>   4

A=>   8 7 6 5
B=>   3 2
C=>   4 1

A=>   8 7 6 5 2
B=>   3
C=>   4 1

A=>   8 7 6 5 2 1
B=>   3
C=>   4

A=>   8 7 6 5 2 1
B=>
C=>   4 3

A=>   8 7 6 5 2
B=>   1
C=>   4 3

A=>   8 7 6 5
B=>   1
C=>   4 3 2

A=>   8 7 6 5
B=>
C=>   4 3 2 1

A=>   8 7 6
B=>   5
C=>   4 3 2 1

A=>   8 7 6 1
B=>   5
C=>   4 3 2

A=>   8 7 6 1
B=>   5 2
C=>   4 3

A=>   8 7 6
```

```
B=>   5 2 1
C=>   4 3

A=>   8 7 6 3
B=>   5 2 1
C=>   4

A=>   8 7 6 3
B=>   5 2
C=>   4 1

A=>   8 7 6 3 2
B=>   5
C=>   4 1

A=>   8 7 6 3 2 1
B=>   5
C=>   4

A=>   8 7 6 3 2 1
B=>   5 4
C=>

A=>   8 7 6 3 2
B=>   5 4 1
C=>

A=>   8 7 6 3
B=>   5 4 1
C=>   2

A=>   8 7 6 3
B=>   5 4
C=>   2 1

A=>   8 7 6
B=>   5 4 3
C=>   2 1

A=>   8 7 6 1
B=>   5 4 3
C=>   2

A=>   8 7 6 1
B=>   5 4 3 2
C=>

A=>   8 7 6
B=>   5 4 3 2 1
C=>
```

```
A=>   8 7
B=>   5 4 3 2 1
C=>   6

A=>   8 7
B=>   5 4 3 2
C=>   6 1

A=>   8 7 2
B=>   5 4 3
C=>   6 1

A=>   8 7 2 1
B=>   5 4 3
C=>   6

A=>   8 7 2 1
B=>   5 4
C=>   6 3

A=>   8 7 2
B=>   5 4 1
C=>   6 3

A=>   8 7
B=>   5 4 1
C=>   6 3 2

A=>   8 7
B=>   5 4
C=>   6 3 2 1

A=>   8 7 4
B=>   5
C=>   6 3 2 1

A=>   8 7 4 1
B=>   5
C=>   6 3 2

A=>   8 7 4 1
B=>   5 2
C=>   6 3

A=>   8 7 4
B=>   5 2 1
C=>   6 3

A=>   8 7 4 3
```

```
B=>   5 2 1
C=>   6

A=>   8 7 4 3
B=>   5 2
C=>   6 1
```