ACM-ICPC Live Archive

6307 Grass

Owen is a college student, and he earns his tuition fee by cutting grass for his neighbors in the weekends. Unlike the other weeding service, Owen's service is charged by the number of turns made when cutting grass, and he has to weed at least one cell of grass, which is a one meter by one meter square area, between every two turns. Given a 2^n meter by 2^n meter grass area, Owen develops a cutting path planning algorithm as follows.

1. First, he divides the grass area to four equal-sized square subarea (i.e., each one is a 2^{n-1} meter by 2^{n-1} meter square).

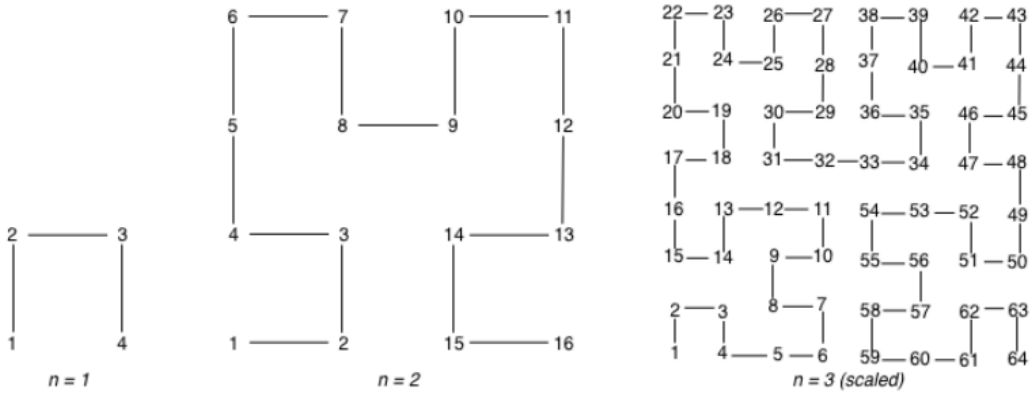
2. He applies the solution of 2^{n-1} meter by 2^{n-1} meter grass area to both of the *northwest* and *northeast* subareas.

3. He rotates the solution of 2^{n-1} meter by 2^{n-1} meter grass area by 90 degree clockwise, and applies the rotated results to the *southwest* subarea.

4. He rotates the solution of 2^{n-1} meter by 2^{n-1} meter grass area by 90 degree counterclockwise, and applies the rotated results to the *southeast* subarea.

5. He always starts from the most *southwest* corner and ends at the most *southeast* corner of the grass area. Moreover, he always visits the *southwest* subarea first, followed by the *northwest* subarea, the *northeast* subarea, and the *southeast* subarea.

The figures below show Owen's moving sequence in the grass area, when $n = 1, 2$, and 3, respectively.



We let the coordinate (0, 0) represents the most southwest cell and $(n-1, n-1)$ be the most northeast cell in the 2^n meter by 2^n meter grass area. Your task is to find the coordinate of the k-th visited cell, as well as the coordinate of its neighbouring cell that has the greatest distance (i.e., the difference of the visiting sequence number) to the k-th visited cell, based on

Owen's approach. For instance, when $n = 2$ and $k = 14$, the coordinate of the k-th visited cell is (2, 1). The neighbouring cells of (2, 1) are (2, 0), (1, 1), (2, 2), and (3, 1); and their visiting sequence numbers are 15, 3, 9, and 13 respectively. Therefore, the greatest distance is 11 because 14 - 3 = 11, and the cell that results in the greatest distance is (1, 1).

Input

There are multiple test cases in the input file. For each test case, there are two integers separated by a single white space in a line. The first integer is n indicating the grass area is a 2^n meter by 2^n meter square, and the second integer is k. In this problem, we assume that $1 \leq n \leq 15$ and $1 \leq k \leq 2^{2n}$. A test case starting with '0' denotes the end of the input file.

Output

For each test case, output the coordinate of the k-th visited cell, followed by the coordinate of its neighbouring cell of the greatest distance, in a line. All the coordinates are output in the order of the west-east direction/axis first and the south-north direction/axis next; and all output numbers are separated by a single white space. If there are multiple neighbouring cells that have the greatest distance to the k-th cell, please output them in ascending order with preference to the west-east direction/axis first and the south-north direction/axis next.

Sample Input

```
1 3
2 14
3 23
0
```

Sample Output

```
1 1 0 1 1 0
2 1 1 1
1 7 2 7
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