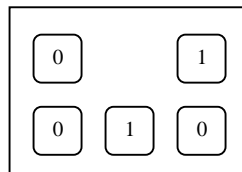


## Problem 2: Do the Binary Shuffle

Almost everyone is familiar with the "seven puzzle." The puzzle board has  $M$  rows and  $N$  columns of squares, each square (except one) containing a tile marked with a letter or digit or symbol, and one empty square. In each move, any one of the tiles neighboring the empty square can be moved (by sliding it) from its square into the empty square giving a different puzzle configuration.

In this problem each of the tiles in such a puzzle is marked with a binary digit (0 or 1). After you make exactly  $K$  moves of the tiles, treat each row as a separate  $N$ -digit binary number (treating the empty location as if it contained zero). What we want to know is the maximum number of unique binary integers that can possibly be created in this manner, considering all possible sequences of  $K$  moves.

Let's consider a simple example. Suppose the initial puzzle configuration looked like that shown below, and that you make exactly one move. There are three possible choices for that move. The first choice is to move the 0 on the first row right; this yields the binary numbers 001 and 010 (treating the empty square as if it contained zero). The second choice is to move the 1 on the first row left. This yields the binary number 010 on each row. The third choice is to move the 1 on the second row up, yielding 011 and 000. So making one move could yield at most four binary numbers: 001, 010, 011 and 000.



### Input

There will be multiple cases numbered 1, 2, .... The input for each case begins with a line containing three integers  $M$ ,  $N$ , and  $K$ .  $M$  specifies the number of rows in the puzzle (between 1 and 5), and  $N$  specifies the number of columns (between 1 and 6).  $K$  specifies the maximum number of moves you may make; it will be no larger than 15.

Following the first line of input there will be  $M$  lines, each containing  $N$  characters chosen from '0', '1', and 'X'. Each character may be preceded and followed by whitespace (blanks or tabs). These lines specify the binary values on each tile and the position of the empty square (by the 'X' character). 'X' will appear exactly once.

The last case will be followed by a line containing a single 0.

**Output**

For each case, display the case number (1, 2, ...) and the maximum number of different binary values that could be produced. Use the format shown in the samples below. Display a blank line after the output for each case.

**Sample Input**

```
2 3 1
0 x 1
0 1 0
2 2 2
0 x
1 0
0
```

**Output for the Sample Input**

```
Case 1: 4 binary numbers

Case 2: 3 binary numbers
```