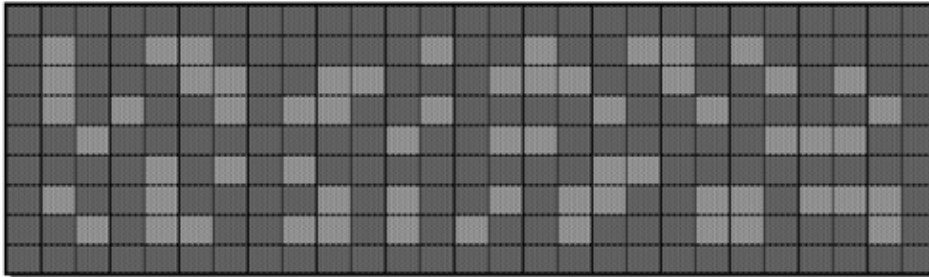




## 4662 - The Puzzle Board from God

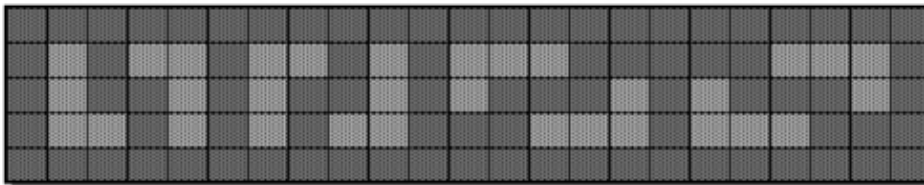
Asia - Jakarta - 2009/2010

Once upon a time, there was a man known as Mr. Bonus (Born at Binus), no one know his real name. One day, after miles of walk, he sat and took a rest. Accidentally, a board fell from sky and hit his head. He was very angry because he thought someone had intentionally thrown that board, but he did not see anyone around. So he thought that board is from God. He tried to look at that board and found a lot of puzzle shape like this:

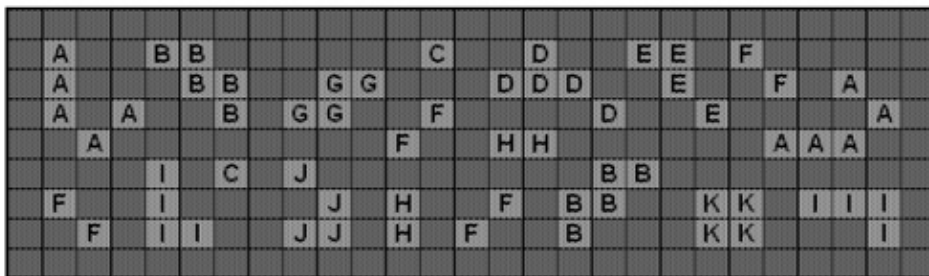


He thought that God want him to calculate how many different shapes are there in that board. Mr. Bonus: "This is very easy, I just need to open my BinusBerry to make a program to calculate it." But he thought that he should take a rest, so he called you to solve his problem.

You are about to count how many different shapes are there in the board. Two shapes are considered the same if they can be matched by rotating (90, 180, or 270 degree) and/or mirroring. These 8 shapes are considered as the same shape:



You should output the number of different shapes and label the puzzles. The same puzzle should use the same label. This is the result that Mr. Bonus wanted:



### Input

Input consists of several cases. Each case begins with two integer  $R$  and  $C$  ( $1 \leq R, C \leq 100$ ) the number of rows and columns of the board. Next,  $R$  rows follow each with  $C$  characters (either '0' or '1') which correspond

to the puzzle. Input will be ended by  $R = C = 0$ .

## Output

For each case, first print in a line the number of different shapes. Next, print the board ( $R$  lines) and replace each shape with label (A-Za-z), in such a way that, when the rows of the board are concatenated from top to bottom, the resulting string is lexicographically smallest. Use the same label for the same shape. There will be at most 52 different shapes and 500 shapes. Put a blank line between cases.

## Sample Input

```
9 27
00000000000000000000000000000000
010011000000100100110100000
010001100110001110010010100
010100101100100001001000010
001000000001001100000011100
000010101000000001100000000
010010000101001011001101110
001011001101010010001100010
0000000000000000000000000000
0 0
```

## Sample Output

```
11
00000000000000000000000000000000
0A00BB000000C00D00EE0F00000
0A000BB00GG000DDD00E00F0A00
0A0A00B0GG00F0000D00E0000A0
00A00000000F00HH000000AAA00
0000I0C0J00000000BB00000000
0F00I0000J0H00F0BB00KK0III0
00F0II00JJ0H0F00B000KK000I0
00000000000000000000000000000000
```

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