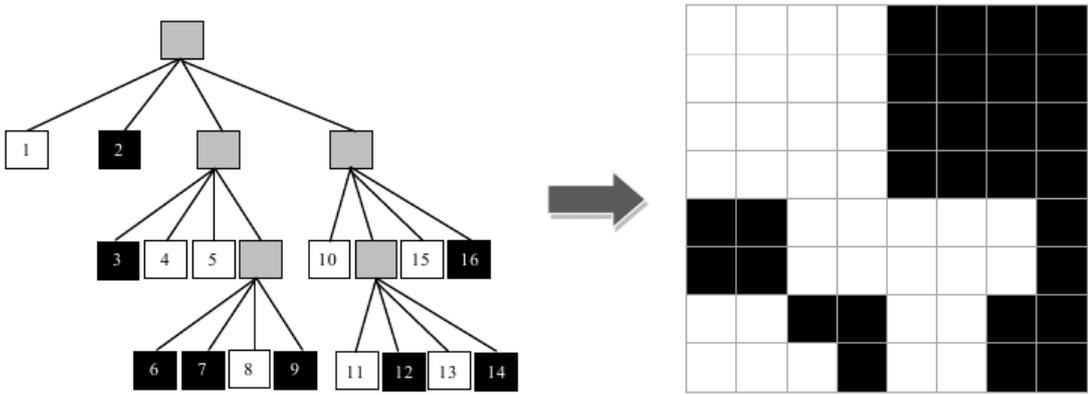


11948 Reading a Quadtree

A quadtree, first introduced by Finkel and Bentley, is a tree data-structure in which each internal node has exactly four children. Quadtrees are often used for problems that can be mapped into a two-dimensional space which is then recursively subdivided it into four equally-sized regions while a certain condition holds. The problem consists in reading a compressed binary image represented with a quadtree and determining which pixels are set to white.

For a better understanding of this problem, consider the third test case from Sample Input, represented in the figure. The uncompressed binary image is composed by (8 x 8) pixels, where 35 of them are white. Notice each node in the quadtree is mapped into a square area from the target image. White nodes denote areas composed by white pixels exclusively, whereas black nodes denote areas with only black pixels; finally, gray nodes are composed by white and black pixels and thus, they need to be subdivided into four new square areas. Notice that the order of visiting square areas is: left to right and top to bottom.



Input

The first line contains an integer $N > 0$ denoting the number of test cases.

The next N lines start each with the length L of the target image; L has to be a power of 2.

The length is followed by a space and a sequence of '0', '1' and '*', denoting black, white and gray nodes of the quadtree, respectively. The quadtree is traversed in pre-order.

Output

The output consists of N lines containing each a comma-separated list of either:

- a) (x, y) position of a pixel adjacent horizontally by black pixels, or
- b) $(x_i - x_f, y)$, where $x_f > x_i$: a sequence of white pixels at row y surrounded by black pixels.

The following holds: $1 \leq x, x_i, x_f, y \leq L$. Traverse the binary image from left to right, top to bottom.

If L is not a power of 2, the output should display the text 'Invalid length', instead.

Sample Input

```
3
4 **1000*010010
7 *101*0100
8 *10*011*0010*1*101010
```

Sample Output

```
(1,1), (4,1), (1-2,3), (1-2,4)
Invalid length
(1-4,1), (1-4,2), (1-4,3), (1-4,4), (3-7,5), (3-7,6), (1-2,7), (5-6,7), (1-3,8), (5-6,8)
```