

## Practice Problem A: Happy 2004

Input File: happy.in

Consider a positive integer  $X$ , and let  $S$  be the sum of all positive integer divisors of  $2004^X$ . Your job is to determine  $S$  modulo 29 (the rest of the division of  $S$  by 29).

Take  $X = 1$  for an example. The positive integer divisors of  $2004^1$  are 1, 2, 3, 4, 6, 12, 167, 334, 501, 668, 1002 and 2004. Therefore  $S = 4704$  and  $S$  modulo 29 is equal to 6.

### Input

The input consists of several test cases. Each test case contains a line with the integer  $X$  ( $1 \leq X \leq 10000000$ ).

A test case of  $X = 0$  indicates the end of input, and should not be processed.

### Output

For each test case, in a separate line, please output the result of  $S$  modulo 29.

#### Sample Input

#### Output for the Sample Input

1	6
10000	10
0	

## Practice Problem B: City hall

Input File: city.in

Because of its age, the City Hall has suffered damage to one of its walls. A matrix with  $M$  rows and  $N$  columns represents the encoded image of that wall, where 1 represents an intact wall and 0 represents a damaged wall (like in Figure-1).

```
1110000111
1100001111
1000000011
1111101111
1110000111
```

Figure-1

To repair the wall, the workers will place some blocks vertically into the damaged area. They can use blocks with a fixed width of 1 and different heights of  $\{1, 2, \dots, M\}$ .

For a given image of the City Hall's wall, your task is to determine how many blocks of different heights are needed to fill in the damaged area of the wall, and to use the least amount of blocks.

### Input

There is only one test case. The case starts with a line containing two integers  $M$  and  $N$  ( $1 \leq M, N \leq 200$ ). Each of the following  $M$  lines contains a string with length of  $N$ , which consists of "1"s and/or "0"s. These  $M$  lines represent the wall.

### Output

You should output how many blocks of different heights are needed. Use separate lines of the following format:

$k \ C_k$

where  $k \in \{1, 2, \dots, M\}$  means the height of the block, and  $C_k$  means the amount of blocks of height  $k$  that are needed. You should not output the lines where  $C_k = 0$ . The order of lines is in the ascending order of  $k$ .

### Sample Input

```
5 10
1110000111
1100001111
1000000011
1111101111
1110000111
```

### Output for the Sample Input

```
1 7
2 1
3 2
5 1
```