



# Hash Code

by Google France

EN

*Problem statement for the Test Round, March 27th, 2015*

## Pizza Regina



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## Introduction

The Chef has prepared a huge Pizza Regina for tonight, with tomatoes, mozzarella, ham and mushrooms. As we all know, in order to be not only tasty and appealing, but also *inspiring*, a slice of Pizza Regina has to meet strict constraints on the proportions of individual ingredients.

## Task

Given the constraints on the desired amount of individual ingredients in a slice and the layout of the pizza, cut slices out of the pizza. Aim to cut out as much pizza as possible to minimize waste.

## Pizza

The pizza is represented as a rectangular, 2-dimensional grid of ***R*** rows and ***C*** columns. The cells within the grid are referenced using a pair of 0-based coordinates  $[r, c]$ , denoting respectively the row and the column of the cell.

Each cell of the pizza contains either:

- ham, represented in the input file as **H**; or
- any combination of mushroom, mozzarella and tomatoes; represented in the input file as **T**

## Ultimate slice

Slice of pizza is a rectangular, contiguous subset of its cells delimited by two rows and two columns. Ultimate slice is a slice that contains at least ***H*** cells of ham and at most ***S*** cells in total - surprising as it is, there is such a thing as too much pizza in one slice.

## Goal

The task is to cut non-overlapping ultimate slices out of the pizza, cutting out as many cells as possible.

## Input data

The input data is provided in a plain text file containing exclusively ASCII characters with lines terminated with a single '\n' character at the end of each line (UNIX-style line endings).

The file consists of:

- one line containing the following natural numbers separated by single spaces:
  - ***R*** ( $1 \leq R \leq 1000$ ) denotes the number of rows,
  - ***C*** ( $1 \leq C \leq 1000$ ) denotes the number of columns,
  - ***H*** ( $1 \leq H \leq 1000$ ) denotes the minimum number of ham cells in an ultimate slice
  - ***S*** ( $1 \leq S \leq 1000$ ) denotes the maximum total number of cells of an ultimate slice
- ***R*** lines describing the layout of individual, subsequent rows of the pizza. Each of these lines contains ***C*** characters describing the content of the individual, subsequent cells of the row. The *i*-th character will be either 'H' (for ham) or 'T' (for other ingredient), as described above.

## Example

An example input file could look as follows.

3 5 1 6 TTTTT THHHT TTTTT	3 rows, 5 columns, 1 ham per slice minimum, max 6 cells per slice.
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Example input file.

## Submissions

### File format

A submission file has to be a plain text file containing exclusively ASCII characters with lines terminated with either a single '\n' character at the end of each line (UNIX-style line endings) or '\r\n' characters at the end of each line (Windows-style line endings).

The file has to consist of:

- one line containing a single natural number ***U***, representing the total number of ultimate slices to be cut out,

- **U** lines describing the subsequent slices. Each of these lines has to contain the following natural numbers separated by single spaces:
  - $r_1, c_1, r_2, c_2$  ( $0 \leq r_1, r_2 < R, 0 \leq c_1, c_2 < C$ ) denote a slice of pizza delimited by the rows  $r_1$  and  $r_2$  and the columns  $c_1$  and  $c_2$ , including the cells of the delimiting rows and columns. Delimiting rows ( $r_1$  and  $r_2$ ) can be given in any order. Delimiting columns ( $c_1$  and  $c_2$ ) can be given in any order too.

### Example

The following example submission file corresponds to the example input file presented above.

3	3 slices.
0 0 2 1	First slice between rows (0,2) and columns (0,1).
0 2 2 2	Second slice between rows (0,2) and columns (2,2).
0 3 2 4	Third slice between rows (0,2) and columns (3,4).

Example submission file.

T	T	T	T	T
T	H	H	H	T
T	T	T	T	T

Slices described in the example submission file marked in green, orange and purple.

### Validation

For the solution to be accepted, it has to meet the following criteria:

- the format of the file has to match the description above,
- each cell of the pizza has to be included in at most one slice,
- each slice has to contain at least **H** cells of ham,
- total area of each slice has to be lower or equal to **S**

### Scoring

The solution will get a score equal to the total number of cells in all slices cut out of the pizza.