# Exercises: Multidimensional Arrays

Problems for exercises and homework for the ["CSharp Advanced" course @ Software University](https://softuni.bg/courses/csharp-advanced).

You can check your solutions here:

<https://judge.softuni.bg/Contests/599/Multidimensional-Arrays-Exercise>

## Lego Blocks

You are given two **jagged arrays**. Each array represents a **Lego block** containing integers. Your task is first to **reverse** the second jagged array and then check if it would **fit perfectly** in the first jagged array.



The picture above shows exactly what **fitting** **arrays** means. If the arrays fit perfectly you should **print out** the newly made rectangular matrix. If the arrays do not match (they do not form a rectangular matrix) you should print out the **number of cells** in the first array and in the second array combined. The examples below should help you understand the assignment better.

### Input

The first line of the input comes as an **integer** **number, n,** saying how many rows are there in both arrays. Then you have **2 \* n** lines of numbers separated by whitespace(s). The first **n** lines are the rows of the first jagged array; the next **n** lines are the rows of the second jagged array. There might be leading and/or trailing whitespace(s).

### Output

You should print out the combined matrix in the format:  
**[*elem, elem, …, elem*]  
[*elem, elem, …, elem*]  
[*elem, elem, …, elem*]**If the two arrays do not fit you should print out: **The total number of cells is: *count***

### Constraints

* The number n will be in the range [2…10]
* Time limit: 0.3 sec. Memory limit: 16 MB

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  1 1 1 1 1 1  2 1 1 3  1 1  2 2 2 3 | [1, 1, 1, 1, 1, 1, 1, 1]  [2, 1, 1, 3, 3, 2, 2, 2] |
| 2  1 1 1 1 1  1 1 1  1  1 1 1 1 1 | The total number of cells is: 14 |

## \*Radioactive Mutant Vampire Bunnies

Browsing through GitHub, you come across an old JS Basics teamwork game. It is about very nasty bunnies that multiply extremely fast. There’s also a player that has to escape from their lair. You really like the game so you decide to port it to C# because that’s your language of choice. The last thing that is left is the algorithm that decides if the player will escape the lair or not.

First, you will receive a line holding integers **N** and **M**, which represent the rows and columns in the lair. Then you receive **N** strings that can **only** consist of **“.”**, **“B”**, **“P”**. The **bunnies** are marked with “**B”,** the **player** is marked with “**P**”, and **everything** else is free space, marked with a dot **“.”**. They represent the initial state of the lair. There will be **only** one player. Then you will receive a string with **commands** such as **LLRRUUDD** – where each letter represents the next **move** of the player (Left, Right, Up, Down).

**After** each step of the player, each of the bunnies spread to the up, down, left and right (neighboring cells marked as “.” **changes** their value to B). If the player **moves** to a bunny cell or a bunny **reaches** the player, the player has died. If the player goes **out** of the lair **without** encountering a bunny, the player has won.

When the player **dies** or **wins**, the game ends. All the activities for **this** turn continue (e.g. all the bunnies spread normally), but there are no more turns. There will be **no** stalemates where the moves of the player end before he dies or escapes.

Finally, print the final state of the lair with every row on a separate line. On the last line, print either **“dead: {row} {col}”** or **“won: {row} {col}”**. Row and col are the coordinates of the cell where the player has died or the last cell he has been in before escaping the lair.

### Input

* On the first line of input, the numbers **N** and **M** are received – the number of **rows** and **columns** in the lair
* On the next N lines, each row is received in the form of a string. The string will contain only “.”, “B”, “P”. All strings will be the same length. There will be only one “P” for all the input
* On the last line, the directions are received in the form of a string, containing “R”, “L”, “U”, “D”

### Output

* On the first N lines, print the final state of the bunny lair
* On the last line, print the outcome – “won:” or “dead:” + {row} {col}

### Constraints

* The dimensions of the lair are in range [3…20]
* The directions string length is in range [1…20]

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 5 8  .......B  ...B....  ....B..B  ........  ..P.....  ULLL | BBBBBBBB  BBBBBBBB  BBBBBBBB  .BBBBBBB  ..BBBBBB  won: 3 0 |
| 4 5  .....  .....  .B...  ...P.  LLLLLLLL | .B...  BBB..  BBBB.  BBB..  dead: 3 1 |

## \*Crossfire

You will receive **two** **integers** which represent the **dimensions** of a **matrix**. Then, you must **fill** **the** **matrix** with **increasing** **integers** starting from 1, and continuing on every row, like this:  
first row: 1, 2, 3, …, n  
second row: n + 1, n + 2, n + 3, …, n + n  
third row: 2 \* n + 1, 2 \* n + 2, …, 2 \* n + n

You will also receive several commands in the form of **3 integers** separated by a space. Those 3 integers will represent a **row** in the matrix, a **column** and a **radius**. You must then **destroy** the cells which correspond to those arguments **cross-like.**

**Destroying** a cell means that, **that** **cell** becomes completely **nonexistent** in the matrix.Destroying cells **cross-like** means that you form a **cross figure** with center point - equal to the cell with coordinates – the **given row** and **column**, and **lines** with length equal to the **given radius**. See the examples for more info.

The **input ends** when you receive the command “Nuke it from orbit”. When that happens, you must print what has remained from the initial matrix.

### Input

* On the first line you will receive the dimensions of the matrix. You must then fill the matrix according to those dimensions
* On the next several lines you will begin receiving 3 integers separated by a single **space**, which represent the row, col and radius. You must then destroy cells according to those coordinates
* When you receive the command “**Nuke it from orbit**” the input ends

### Output

* The output is simple. You must print what is left from the matrix
* Every row must be printed on a new line and every column of a row - separated by a space

### Constraints

* The dimensions of the matrix will be integers in the range [2, 100]
* The given rows and columns will be valid integers in the range [-231 + 1, 231 - 1]
* The radius will be in range [0, 231 - 1]
* Allowed time/memory: 250ms/16MB

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comment** |
| 5 5  3 3 2  4 3 2  Nuke it from orbit | 1 2 3 4 5  6 7 8 10  11 12 13  16  21 | Initial matrix:  1 2 3 4 5  6 7 8 9 10  11 12 13 14 15  16 17 18 19 20  21 22 23 24 25  Result from first destruction:  1 2 3 4 5  6 7 8 10  11 12 13 15  16  21 22 23 25  Result from second destruction:  1 2 3 4 5  6 7 8 10  11 12 13  16  21 |
| 5 5  4 4 4  Nuke it from orbit | 1 2 3 4  6 7 8 9  11 12 13 14  16 17 18 19 |  |

## \*The Heigan Dance

At last, level 80. And what do level eighties do? Go raiding. This is where you are now – trying not to be wiped by the famous dance boss, Heigan the Unclean. The fight is pretty straightforward - dance around the Plague Clouds and Eruptions, and you’ll be just fine.

Heigan’s chamber is a 15-by-15 two-dimensional array. The player always starts at the **exact center.** For each turn, Heigan uses a spell that hits a certain cell and the neighboring **rows/columns**. For example, if he hits (1,1), he also hits (0,0, 0,1, 0,2, 1,0 … 2,2). If the player’s current position is within the area of damage, the player tries to move. First, he tries to move **up**, if there’s **damage/wall**, he tries to move **right**, then **down**, then **left**. If he **cannot move** in any direction, because **the cell is damaged** or there is **a wall**, the player **stays** in place and takes the damage.

**Plague cloud** does 3500 damage **when it hits**, and 3500 damage **the next turn**. Then it **expires. Eruption** does 6000 damage **when it hits.** If a spell hits a player that also has an active Plague Cloud from the previous turn, the **cloud** damage is applied **first**. **Both** Heigan and the player **may** die in the same turn. If Heigan is **dead**, the spell he **would** have casted is **ignored**.

The player always starts at **18500** hit points; Heigan starts at **3,000,000** hit points. **Each** turn, the player does damage to Heigan. The fight is over either when the player is **killed**, or Heigan is **defeated**.

### Input

* On the first line you receive a floating-point number **D –** the damage done to Heigan each turn
* On the next several lines – you receive input in format **{spell} {row} {col}** – **{spell}** is either **Cloud** or **Eruption**

### Output

* On the first line
  + If Heigan is defeated: “**Heigan:** **Defeated!**”
  + Else: “**Heigan: {remaining**}”, where remaining is rounded to two digits after the decimal separator
* On the second line:
  + If the player is killed: “**Player:** **Killed by {spell}**”
  + Else “**Player: {remaining}”**
* On the third line: “**Final position: {row, col}**” -> the last coordinates of the player

### Constraints

* **D** is a floating-point number in range [0 … 500000]
* A damaging spell will always affect at least one cell
* Allowed memory: 16 MB
* Allowed working time: 0.25s

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 10000  Cloud 7 7  Eruption 6 7  Eruption 8 7  Eruption 8 7 | Heigan: 2960000.00  Player: Killed by Eruption  Final position: 8, 7 |

|  |  |
| --- | --- |
| **Input** | **Output** |
| 500000  Cloud 7 6  Eruption 7 8  Eruption 7 7  Cloud 7 8  Eruption 7 9  Eruption 6 14  Eruption 7 11 | Heigan: Defeated!  Player: 12500  Final position: 7, 11 |

|  |  |
| --- | --- |
| **Input** | **Output** |
| 12500.66  Cloud 7 7  Cloud 7 7  Cloud 7 7  Cloud 7 7 | Heigan: 2949997.36  Player: Killed by Plague Cloud  Final position: 7, 7 |

## \*Parking System

The parking lot in front of SoftUni is one of the busiest in the country, and it’s a common cause for conflicts between the doorkeeper Bai Tzetzo and the students. The SoftUni team wants to proactively resolve all conflicts, so an automated parking system should be implemented. They are organizing a competition – Parkoniada – and the author of the best parking system will win a romantic dinner with RoYaL. That’s **exactly** what you’ve been dreaming of, so you decide to join in.

The parking lot is a **rectangular** matrix where the **first** column is **always** free and all other cells are parking spots. A car can enter from **any cell** of the **first column** and then decides to go to a specific spot. If that spot is **not** free, the car searches for the **closest** free spot on the **same** row. If **all** the cells on that specific row are used, the car cannot park and leaves. If **two** free cells are located at the **same** distance from the **initial** parking spot, the cell which is **closer** to the entrance is preferred. A car can **pass** through a used parking spot.

Your task is to calculate the distance travelled by each car to its parking spot.

Example: A car enters the parking at row 1. It wants to go to cell 2, 2 so it moves through **exactly four** cells to reach its parking spot.

### Input

* On the first line of input, you are given the integers **R** and **C**, defining the dimensions of the parking lot
* On the next several lines, you are given the integers **Z, X,** **Y** where **Z** is the entry row and **X, Y** are the coordinates of the desired parking spot
* The input stops with the command ‘**stop**’. All integers are separated by a **single** space

### Output

* For each car, print the distance travelled to the desired spot or the first free spot
* If a car cannot park on its desired row, print the message ‘**Row {row number} full**’

### Constraints

* 2 ≤ R,C ≤ 10000
* Z, X, Y are inside the dimensions of the matrix. Y is never on the first column
* There are no more than 1000 input lines
* Allowed time/space: 0.1s (C#) /16MB

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4 4  1 2 2  2 2 2  2 2 2  3 2 2  stop | 4  2  4  Row 2 full |

## \*String Matrix Rotation

You are given a **sequence of text lines**. Assume these text lines form a **matrix of characters** (pad the missing positions with spaces to build a rectangular matrix). Write a program to **rotate the matrix** by 90, 180, 270, 360, … degrees. Print the result at the console as sequence of strings. Examples:

|  |  |  |  |
| --- | --- | --- | --- |
| **Input** | **Rotate(90)** | **Rotate(180)** | **Rotate(270)** |
| hello  softuni  exam |  |  |  |
|  |

### Input

* The first line holds a command in format "**Rotate(X)**" where **X** are the degrees of the requested rotation
* The next lines contain the **lines of the matrix** for rotation
* The input ends with the command **"END"**

The input data will always be valid and in the format described. There is no need to check it explicitly

### Output

* Print at the console the **rotated matrix** as a sequence of text lines

### Constraints

* The rotation **degrees** are positive integer in the range [0…90000], where **degrees** is **multiple of 90**
* The number of matrix lines is in the range [1…**1 000**]
* The matrix lines are **strings** of length 1 … 1 000
* Allowed working time: 0.2 seconds. Allowed memory: 16 MB

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| Rotate(90)  hello  softuni  exam  END | esh  xoe  afl  mtl  uo  n  i | Rotate(180)  hello  softuni  exam  END | maxe  inutfos  olleh | Rotate(270)  hello  softuni  exam  END | i  n  ou  ltm  lfa  eox  hse |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| Rotate(720)  js  exam  END | js  exam | Rotate(810)  js  exam  END | ej  xs  a  m | Rotate(0)  js  exam  END | js  exam |