

Assignment 3 2021 Spring

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1.[Easy] Kaleidoscope (20 points)

Description

Kaleidoscope (万花筒) is a fun toy. It uses reflective surfaces to form a symmetrical pattern.

Gogo is poor and cannot afford a kaleidoscope. She hopes you can write a program to simulate a kaleidoscope.

Gogo will provide a pattern on the top left, and your program should output symmetrical patterns on the top right, bottom left, and bottom right based on the reflection.

Input

Using `System.in`

The first line of input contains two integers `M` and `N` ($0 \leq M, N \leq 50$), which are the height and width of the pattern.

There are `M` lines following the first line. Each line contains `N` integers (in the range of `int`).

Output

The output contains `2M` lines. Each line contains `2N` integers, separated by a space.

The pattern on the top right is the horizontal flip of the input.

The pattern on the bottom left is the vertical flip of the input.

The pattern on the bottom right flips both horizontally and vertically.

Sample Input 1

```
2 2
1 2
3 4
```

Sample Output 1

```
1 2 2 1
3 4 4 3
3 4 4 3
1 2 2 1
```

Sample Input 2

```
2 3
1 2 3
45 678 9999
```

Sample Output 2

```
1 2 3 3 2 1
45 678 9999 9999 678 45
45 678 9999 9999 678 45
1 2 3 3 2 1
```

2. [Hard] Win the Gobang (30 points)

Description

Yan is not good at playing Gobang and have been beaten 9 times by his friends last time. In order not to be defeated again, Yan ask you for help. You'd like to design an AI to help Yan win the next game with his friend.

Firstly, let's write a simple program that can play the last chess to win the game.

Input

Using `System.in`

The first line contains one integer n , representing the size of the chessboard. ($5 \leq n \leq 20$)

Then there will be n lines with n specific characters per line, separated by spaces, showing the chesses on the chessboard.

There will be 3 kinds of characters with different meanings:

'N' represents an empty grid.

'O' represents a grid with your chess on it.

'X' represents a grid with your opponent's chess on it.

NB: We promise that there won't be 5 'O' already in a line on the chessboard.

Output

If you can play only a chess to win the game (to have 5 'O' on a line), print all the location of the grids where you can play the chess to win the game, with the form (x,y) (representing the grid in x th column, and y th row).

Each line contains only one location. The location with small y should be print earlier. If two locations have the same y , the one with smaller x should be print at first.

Print *No* If you can't play only a chess to win the whole game.

NB: Pay attention to the order.

Sample Input 1

```
6
N N N N N N
N N N O N N
N N N O N N
N O O O O N
N N N O N N
N N X X X X
```

Sample Output 1

```
(4,1)
(1,4)
(6,4)
```

Sample Input 2

```
5
N N N O O
N N N O N
X N O X N
X O N O N
X N N O N
```

Sample Output 2

```
No
```

3.[Medium] Mine Sweeper (20 points)

Description

I bet you have played the game *Mine Sweeper*. This question is just about it.

I will give you a chessboard with scale $n * n$. There are several mines on it, which is denoted by `*`. The square with no mine on it is denoted by `-`. Your task is printing the end state of the chessboard. That is, the square with mine will change to `F`, which means it have been discovered and you have placed a flag on it. Additionally, the square with no mine will show a number, which represent the number of mines on its surrounding 8 squares. If it is on the boundary, you can ignore the `null blank` (the examples below can help you understand it better).

Yes, you are an expert on *Mine Sweeper* and every end state of games you played is successful state. :)

Input

The first line is one integer n , which represent the scale of the square chessboard.

The next n lines contain a string, which length is n . That represent one line of the chessboard.

We ensure that $1 \leq n \leq 200$.

Output

n lines and each line show one line of the end state chessboard.

Sample Input 1

```
3
*_*
---
*--
```

Sample Output 1

```
F2F
231
F10
```

Sample Input 2

```
5
*_**_
--*--
*_*_*
-*---
---**
```

Sample Output 2

```
F3FF1
25F52
F4F3F
2F343
112FF
```

Notice: the number of a no-mine-square with no surrounding mine is 0.

4. [Easy] Vector (30 points)

Description

The question is to exercise class and object, and the testing method is by Junit 5.

A vector is something that has both **magnitude** and **direction**. Design a class named `vector` indicates **standard unit vectors** in three-dimensional rectangular coordinate system. All attributes and methods in the class `vector` have been list below:

1. Attributes:

`private int x;` Represents the component in the *x-axis* coordinate direction.

`private int y;` Represents the component in the *y-axis* coordinate direction.

`private int z;` Represents the component in the *z-axis* coordinate direction.

2. Constructor:

```
public Vector(int x, int y, int z)
```

Three parameters in constructor are to initialize three private attributes respectively.

3. Method quadrant:

```
public int quadrant()
```

The method return int integer represents the quadrant about the direction of vector. If the direction of vector is (0,0,0) or parallel of any plane consisted by each two coordinate axis, the method returns an integer -1.

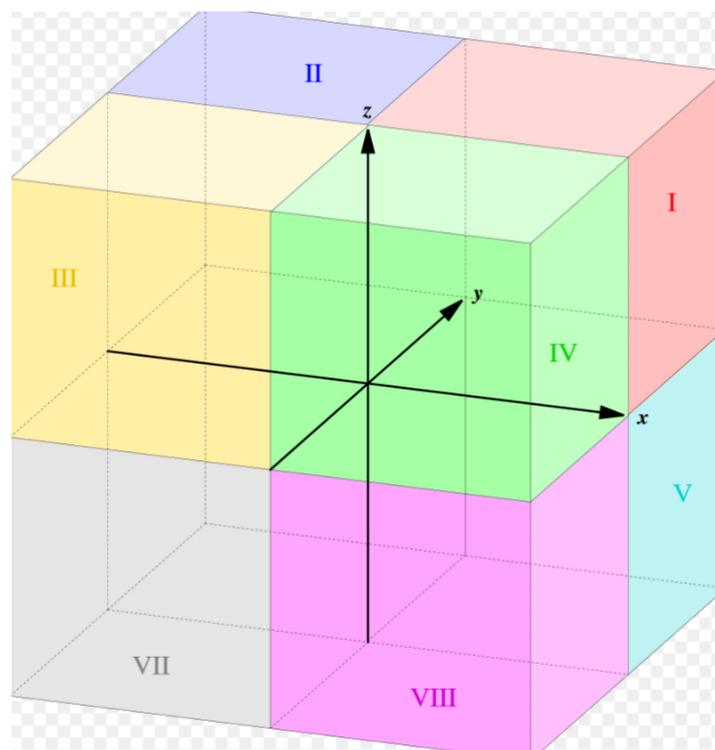
For example:

the return value of (0,1,1) is -1

the return value of (0,0,0) is -1

the return value of (1,1,1) is 1

The quadrant in three-dimensional space can be referenced by the graph below:



4. Method modulus:

```
public double modulus()
```

The method returns the **modulus** of the vector.

5. Method toString:

```
public String toString()
```

The method returns a string as the format: `(x,y,z)`

6. Method add:

```
public Vector add(Vector vector)
```

Adding parameter vector into current vector object, and return the current vector object.

7. Method area:

```
public double area(Vector vector)
```

Return the area of a triangle whose three points are:

1. the original of coordinate (0,0,0)
2. the coordinate of current vector (x,y,z)
3. the coordinate of parameter vector (vector.x, vector.y, vector.z)

8. static method add:

```
public static Vector add(Vector a, Vector b)
```

A static method that adding two parameter vectors a and b into a new vector, and then return the new vector.

9. static method area:

```
public static double area(Vector a, Vector b)
```

A static method that return the area of a triangle whose three points are:

1. the original of coordinate (0,0,0)
2. the coordinate of parameter vector (a.x, a.y, a.z)
3. the coordinate of parameter vector (b.x, b.y, b.z)

Submission and Test:

Submission

- For this question, submit a java file named `vector`
- Your design and return value must strictly follow the description in this document.
- No Chinese characters are allowed to appear in your code.
- No package included.

Test:

Different from those three questions, the testing process of the question is based on Junit5. You can try the java file: `LocalJudge.java` in your local environment first, and then submit it into online judge system.

We also give you a main method and the output of standard program to help you understand the question and check the result.

```
public static void main(String[] args) {
    Vector v1 = new Vector(1, -2, 3);
    Vector v2 = new Vector(-5, 2, 2);
    System.out.println("quadrant of v1 is " + v1.quadrant());
    System.out.println("quadrant of v2 is " + v2.quadrant());
    System.out.printf("Area %.5f\n", v1.area(v2));
    System.out.printf("Area %.5f\n", Vector.area(v1,v2));
    System.out.println(v1.add(v2));
    System.out.println(Vector.add(v1, v2));
}
```

Output:

```
quadrant of v1 is 4
quadrant of v2 is 2
Area 10.64190
Area 10.64190
(-4,0,5)
(-9,2,7)
```