Practice Exercise #24: Matrix Transformation

http://www.comp.nus.edu.sg/~cs1020/4_misc/practice.html

Objective:

- Using two-dimensional array

Task Statement

Given a square matrix, output the final state of the matrix after performing the given operations. There are 3 valid operations:

1. **Rotate r:** Rotate the matrix clockwise by *r* degrees (*r* can only be 90, 180, or 270).
2. **Reflect x:** Reflect the matrix across the x-axis.
3. **Reflect y:** Reflect the matrix across the y-axis.

Input

The first line of the input contains an integer **N** ($1 \leq \mathbf{N} \leq 100$). The subsequent **N** lines contain the values of the **N** x **N** elements. The following line is an integer **K** ($1 \leq \mathbf{K} \leq 100$), where **K** is the number of operations to be performed. The next line is the query with format "Rotate r" ($r \in \{90, 180, 270\}$), "Reflect x" or "Reflect y".

(The above symbols **N** and **K** are used to ease explanation. In your program, you should give more descriptive variable names and follow Java naming convention.)

Output

The output is the final state of the matrix.

Sample Input

```
3
1 2 3
4 5 6
7 8 9
3
Rotate 90
Reflect x
Reflect y
```

Sample Output

```
3 6 9
2 5 8
1 4 7
```

Explanation

1. *Initial matrix:*

   1 2 3
   4 5 6
   7 8 9

2. *After 90° clockwise rotation:*

   7 4 1
   8 5 2
   9 6 3

3. *After reflection across x axis:*

   9 6 3
   8 5 2
   7 4 1

4. *After reflection across y axis:*

   3 6 9
   2 5 8
   1 4 7

Skeleton Program

The client program **Transform.java** is given, and you are not allowed to change it. Hence, there is no need for you to submit this program.

You are to write the service class **Matrix**, whose skeleton program **Matrix.java** is given. You are to complete the methods in this class. You are not to add new methods to this class. You have to submit **Matrix.java**.

Note that in the **Matrix** class, only the constructors, **operate()** and **toString()** are public methods; the rest are private methods and hence are not accessible to client programs. The data attributes and **toString()** method are given and you are not to change them.