

Problem Set 4 Exercise #31: Matrix

Reference: Lecture 10 OOP Unit 3 notes

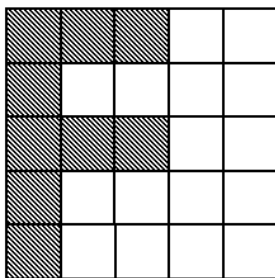
Learning objectives: Object-oriented programming; 2D array as an attribute

Estimated completion time: 45 minutes

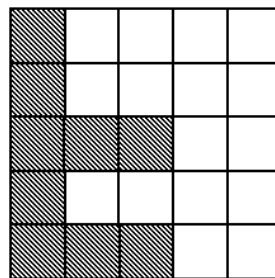
Problem statement:

A 2 dimensional integer square matrix can be manipulated in the following ways.

- **Reflect x:** Reflect the matrix across the x-axis. An example is shown below.

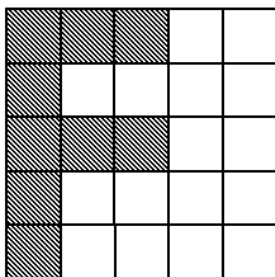


matrix

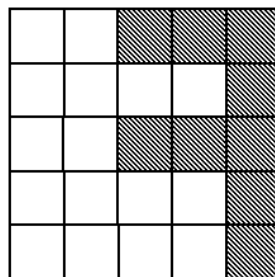


matrix reflected
across x-axis

- **Reflect y:** Reflect the matrix across the y-axis. An example is shown below.

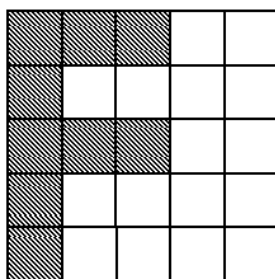


matrix

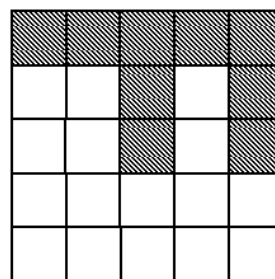


matrix reflected
across y-axis

- **Rotate d :** Rotate the matrix by d degree clockwise; d can be 90° , 180° , or 270° . The following is an example that matrix rotate 90° degree clockwise.



matrix



matrix rotated 90°
clockwise

Write a **Matrix** class (in the program **PS4_Ex31_Matrix.java**) that provides public methods for the above operations. In writing a new method, you should think about how to re-use existing ones rather than start from scratch.

Write a user program **PS4_Ex31_Transform.java** to read a matrix and create a **Matrix** object accordingly. Subsequently it will read a series of commands to perform reflection or rotation on the **Matrix** object.

Sample run #1:

```
Enter the size of the square matrix: 5
Enter elements row by row:
1 1 1 1 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 0
Enter the number of commands: 1
Enter command: Reflect x
0 0 0 0 0
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
1 1 1 1 1
```

Sample run #2:

```
Enter the size of the square matrix: 5
Enter elements row by row:
1 1 1 1 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 0
Enter the number of commands: 1
Enter command: Reflect y
1 1 1 1 1
1 0 0 0 0
1 0 0 0 0
1 0 0 0 0
0 0 0 0 0
```

Sample run #3:

```
Enter the size of the square matrix: 4
Enter elements row by row:
1 1 1 1
0 0 0 1
0 0 0 1
0 0 0 0
Enter the number of commands: 1
Enter command: Rotate 90
0 0 0 1
0 0 0 1
0 0 0 1
0 1 1 1
```

Sample run #4:

```
Enter the size of the square matrix: 3
Enter elements row by row:
2 3 6
7 1 3
3 4 8
Enter the number of commands: 3
Enter command: Rotate 180
Enter command: Reflect y
Enter command: Reflect x
2 3 6
7 1 3
3 4 8
```