Competitive Programming

2D Arrays-Rotation

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Matrix rotation for input 4

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Matrix after rotating 90°

13	9	5	1
14	10	6	2
15	11	7	3
16	12	8	4

How to rotate?

0,0	0,1	0,2	0,3
1,0	1,1	1,2	1,3
2,0	2,1	2,2	2,3
3,0	3,1	3,2	3,3

Swapping

0,0					0,5
5,0					5,5

Swapping

	0,1				
					1,5
4,0					
				5,4	

Swapping

		0,2			
					2,5
3,0					
			5,3		

Pseudo code

```
input angle
total = (angle / 90) % 4
while total > 0:
    for i = 0 to n - 1:
        for j = 0 to n - 1:
            temp[j][n - i - 1] = matrix[i][j]
    for i = 0 to n - 1:
        for j = 0 to n - 1:
            matrix[i][j] = temp[i][j]
    total--
```

Matrix Rotations

- You are given a square matrix of dimension N. Let this matrix be called A. Your task is to rotate A in clockwise direction by S degrees, where S is angle of rotation. On the matrix, there will be 3 types of operations viz.
- Rotation
  - Rotate the matrix A by angle S, presented as input in form of A S
- Querying
  - Query the element at row K and column L, presented as input in form of Q K L
- Updation
  - Update the element at row X and column Y with value Z, presented as input in form of U X Y Z
- Print the output of individual operations as depicted in Output Specification.

Matrix Rotations

- Input Format:
- Input will consist of three parts, viz.
  - Size of the matrix (N)
  - The matrix itself (A = N * N)
  - Various operations on the matrix, one operation on each line. (Beginning either with A, Q or U)
  - -1 will represent end of input
- Note:
  - Angle of rotation will always be multiples of 90 degrees only.
  - All Update operations happen only on the initial matrix. After update all the previous rotations have to be applied on the updated matrix

Matrix Rotations

- Output Format:
  - For each Query operation print the element present at K-L location of the matrix in its current state.
- Constraints:
  - 1<=N<=1000
  - 1<=Aij<=1000
  - 0<=S<=160000
  - 1<=K, L<=N
  - 1<=Q<=100000

Matrix Rotations

Sample Input and Output

Input

```
2
1 2
3 4
A 90
Q 1 1
Q 1 2
A 90
Q 1 1
U 1 1 6
Q 2 2
-1
```

Output

```
3
1
4
6
```

Pseudo code

```
input matrix
totalangle = 0
while true:
        input choice
        if choice == 'A':
                input angle
                rotate(angle)
                totalangle = totalangle + angle
        else if choice == 'Q':
                input row, col
                print matrix[row - 1][col - 1]
        else if choice == 'U':
                input row, col, value
                rotate(360 - totalangle % 360)
                matrix[row - 1][col - 1] = value
                rotate(totalangle)
        else:
                break
```

Pseudo code: rotate

```
total = (angle / 90) % 4
while total > 0:
    for i = 0 to n - 1:
        for j = 0 to n - 1:
            temp[j][n - i - 1] = matrix[i][j]
    for i = 0 to n - 1:
        for j = 0 to n - 1:
            matrix[i][j] = temp[i][j]
    total--
```

Queries?

Thank You…!