X

Programming Assignment 3: Rotate the matrix

Due on 2020-04-02, 23:59 IST

Given a square matrix with **n** rows and **n** columns, you have to write a program to rotate this matrix such that each element is shifted by one place in a clockwise manner.
For example, given the following matrix

1 2 3
4 5 6
7 8 9

The output should be

4 1 2
7 5 3
8 9 6

Input Format:
The first line of the input contains a number n representing the number of rows and columns.
After this, there are **n** rows with each row containing **n** elements separated by a space

Output Format:
Print the elements of the modified matrix with each row in a new line and all the elements in each row is separated by a space.

Example 1:

Input:
3

1 2 3
4 5 6
7 8 9

Output:
4 1 2
7 5 3
8 9 6

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

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

Explanation:
In the first example, there is an odd number of rows and columns hence excluding the middle element i.e. 5 all the elements were shifted by one position in a clockwise manner.
In the second example, there are even number of rows and columns hence all the elements were shifted by one position in a clockwise manner

Sample Test Cases

	Input	Output
Test Case 1	6 1 1 2 2 3 3 2 2 3 3 4 4 3 3 4 4 5 5 4 4 5 5 6 6 5 5 6 6 7 7 6 6 7 7 8 8	2 1 1 2 2 3 3 3 2 3 3 3 4 4 5 4 4 4 5 5 5 4 5 5 6 6 6 7 6 6 6 7 7 8 8 7

Test Case 2

```
18
7 43 9 26 39 8 14 49 24
28 37 34 18 27 23 6 27 2
0
33 12 8 39 50 49 1 36 34
24 23 17 28 7 10 38 41 3
0
8 30 23 45 16 39 4 7 16
39 29 13 6 47 15 4 46 37
10 2 16 50 9 45 7 3 37 3
2 11 39 39 37 20 25 45 1
3
5 45 37 25 28 47 46 27 3
7 40 7 20 20 11 8 3 9 38
11 2 39 12 19 5 18 17 7
14 22 8 13 18 29 50 17 9
23 33 46 48 21 5 25 17 2
3 39 50 44 37 3 7 47 13
22
44 7 38 13 8 38 34 7 49
21 50 40 12 44 20 38 27
34
35 6 17 37 39 19 41 21 4
3 40 28 45 9 38 32 24 11
36
48 37 43 34 31 33 20 41
28 4 46 44 18 16 48 9 6
32
30 12 45 25 37 42 44 44
32 16 41 42 18 14 33 49
35 32
42 50 14 45 27 10 2 15 4
1 24 29 15 7 49 38 36 46
12
12 48 34 41 1 31 50 41 3
1 9 42 46 9 8 19 7 19 42
40 46 25 12 18 27 6 18 1
1 19 34 36 37 46 14 37 3
6 45
10 12 49 18 38 39 47 13
7 49 24 28 49 26 21 44 1
7 34
11 11 46 11 15 20 13 42
41 33 15 8 11 15 49 20 2
9 3
9 1 1 38 9 49 30 47 49 1
4 29 44 38 30 10 44 2 38
16 2 16 42 31 32 31 21 1
4 49 45 24 39 42 15 19 4
4 19
```

```
33 7 43 9 26 39 8 14 49
24 28 37 34 18 27 23 6 2
7
8 30 12 8 39 50 49 1 36
34 24 23 17 28 7 10 38 2
0
10 2 16 23 45 16 39 4 7
16 39 29 13 6 47 15 41 3
0
5 45 37 25 50 9 45 7 3 3
7 32 11 39 39 37 4 46 37
11 2 39 12 19 28 47 46 2
7 37 40 7 20 20 20 25 45
13
23 33 46 48 21 5 5 18 17
7 14 22 8 11 8 3 9 38
44 7 38 13 8 38 34 25 17
23 39 50 13 18 29 50 17
9
35 6 17 37 39 19 41 21 7
49 21 44 37 3 7 47 13 22
48 37 43 34 31 33 20 41
28 43 50 40 12 44 20 38
27 34
30 12 45 25 37 42 44 44
4 40 28 45 9 38 32 24 11
36
42 50 14 45 27 10 2 32 1
6 41 46 44 18 16 48 9 6
32
12 48 34 41 1 31 15 41 2
4 29 15 42 18 14 33 49 3
5 32
40 46 25 12 18 50 41 31
9 42 46 9 7 49 38 36 46
12
10 12 49 18 27 6 18 11 1
9 34 36 37 46 8 19 7 19
42
11 11 46 38 39 47 13 7 4
9 24 28 49 26 21 14 37 3
6 45
9 1 11 15 20 13 42 41 33
15 8 11 15 49 20 44 17 3
4
16 1 38 9 49 30 47 49 14
29 44 38 30 10 44 2 29 3
2 16 42 31 32 31 21 14 4
9 45 24 39 42 15 19 44 1
9 38
```

Test Case 3

```
11
7 13 41 46 35 21 22 43 2
2 45 48
23 28 15 10 16 2 20 11 3
6 38 47
45 44 22 25 2 10 35 1 3
48 46
1 14 37 14 22 50 4 43 38
30 36
17 40 2 12 12 15 48 39 4
23 40
16 43 46 7 20 6 32 24 37
27 25
15 39 44 39 1 31 41 17 2
8 47 7
45 22 28 17 19 21 4 23 5
0 32 38
7 3 40 22 25 13 38 15 4
17 8
43 9 46 6 3 36 10 41 47
1 47
50 20 45 10 10 49 50 18
16 3 11
```

```
23 7 13 41 46 35 21 22 4
3 22 45
45 44 28 15 10 16 2 20 1
1 36 48
1 14 37 22 25 2 10 35 1
38 47
17 40 2 12 14 22 50 4 3
48 46
16 43 46 7 20 12 15 43 3
8 30 36
15 39 44 39 1 6 48 39 4
23 40
45 22 28 17 31 41 32 24
37 27 25
7 3 40 19 21 4 23 17 28
47 7
43 9 22 25 13 38 15 4 50
32 38
50 46 6 3 36 10 41 47 1
17 8
20 45 10 10 49 50 18 16
3 11 47
```

Test Case 4

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

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

Test Case 5

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

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

Test Case 6

```
5
4 1 4 2 3
6 1 3 1 6
2 9 1 5 3
6 8 9 3 2
0 1 5 2 9
```

```
6 4 1 4 2
2 9 1 3 3
6 8 1 1 6
0 9 3 5 3
1 5 2 9 2
```

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Sample solutions (Provided by instructor)

```
# Python program to rotate a matrix

# Function to rotate a matrix
def rotateMatrix(mat):

    if not len(mat):
        return

    """
        top : starting row index
```

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Week 10

Week 11

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```
        bottom : ending row index
        left : starting column index
        right : ending column index
    """

    top = 0
    bottom = len(mat)-1

    left = 0
    right = len(mat[0])-1

    while left < right and top < bottom:

        # Store the first element of next row,
        # this element will replace first element of
        # current row
        prev = mat[top+1][left]

        # Move elements of top row one step right
        for i in range(left, right+1):
            curr = mat[top][i]
            mat[top][i] = prev
            prev = curr

        top += 1

        # Move elements of rightmost column one step downwards
        for i in range(top, bottom+1):
            curr = mat[i][right]
            mat[i][right] = prev
            prev = curr

        right -= 1

        # Move elements of bottom row one step left
        for i in range(right, left-1, -1):
            curr = mat[bottom][i]
            mat[bottom][i] = prev
            prev = curr

        bottom -= 1

        # Move elements of leftmost column one step upwards
        for i in range(bottom, top-1, -1):
            curr = mat[i][left]
            mat[i][left] = prev
            prev = curr

        left += 1

    return mat

# Utility Function
def printMatrix(mat,n):
    for i in range(n):
        for j in range(n):
            if(j==n-1):
                print(mat[i][j],end="")
            else:
                print(mat[i][j],end=" ")

        if(i!=n-1):
            print()

n = int(input())

matrix = []
for i in range(1,n+1):
    l = list(map(int, input ().split ()))
    matrix.append(l)

matrix = rotateMatrix(matrix)
# Print modified matrix
printMatrix(matrix,n)
```