Competitive Programming

2D Arrays-Spiral

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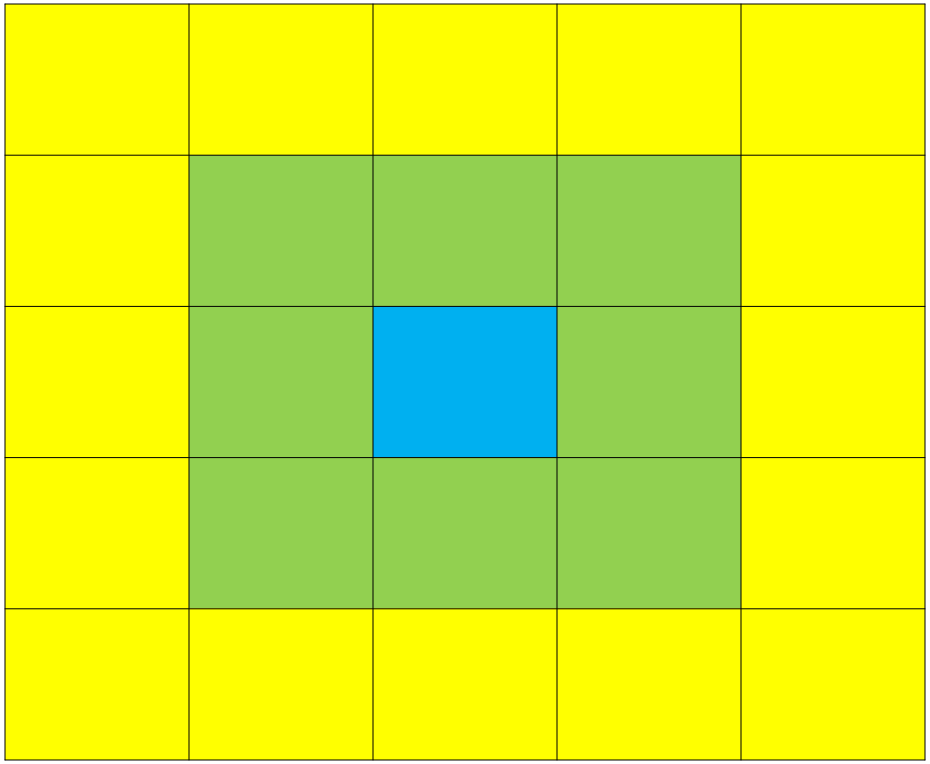
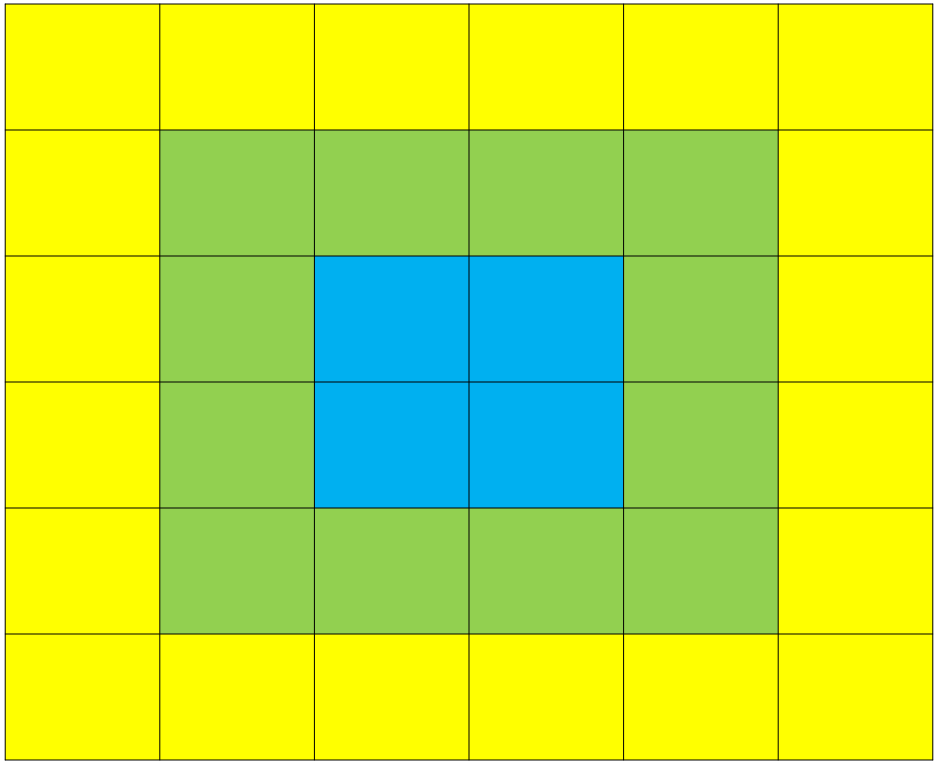
Spiral matrix for input 5

1	**2**	**3**	**4**	**5**
16	**17**	**18**	**19**	**6**
15	**24**	**25**	**20**	**7**
14	**23**	**22**	**21**	**8**
13	**12**	**11**	**10**	**9**

Approach for input 5



Approach for input 6



Hint

- For even numbers, the last square is always 2 x 2.
- For odd numbers, the last square is always 1 x 1.
- Number of full square = N / 2 (Even numbers)
- The last square (1 x 1) element for odd numbers is N^2.

Approach

- Create an array (N x N)
- Maintain a counter for the number
- Print each square separately (N / 2 squares)
  - Print top row
  - Print right column
  - Print bottom row
  - Print left column
  - If N is odd, print the last number

Pseudo code

```
input n
counter = 0
row = col = end_row = end_col = 0
for i = 0 to n / 2 - 1:
        row = col = i
        print top row
        print right column
        print bottom row
        print left column
If n %2 == 1:
        print the last number
```

Pseudo code: Print top row

```
end_col = n - i - 1
while col < end_col:
        matrix[row][col] = ++counter
        col++
```

Pseudo code: Print right column

```
end_row = n - i - 1
while row < end_row:
        matrix[row][col] = ++counter
        row++
```

Pseudo code: Print bottom row

```
end_col = i
while col > end_col:
        matrix[row][col] = ++counter
        col--
```

Pseudo code: Print left column

```
end_row = i
while row > end_row:
        matrix[row][col] = ++counter
        row--
```

Pseudo code: Print last number (odd)

```
if n % 2 == 1
        matrix[n / 2][n / 2] = ++counter
```

Pseudo code: Print matrix

```
for i : 0 to n - 1
        for j : 0 to n - 1
                print matrix[i][j] + "\t"
        print new line
```

Chakravyuha

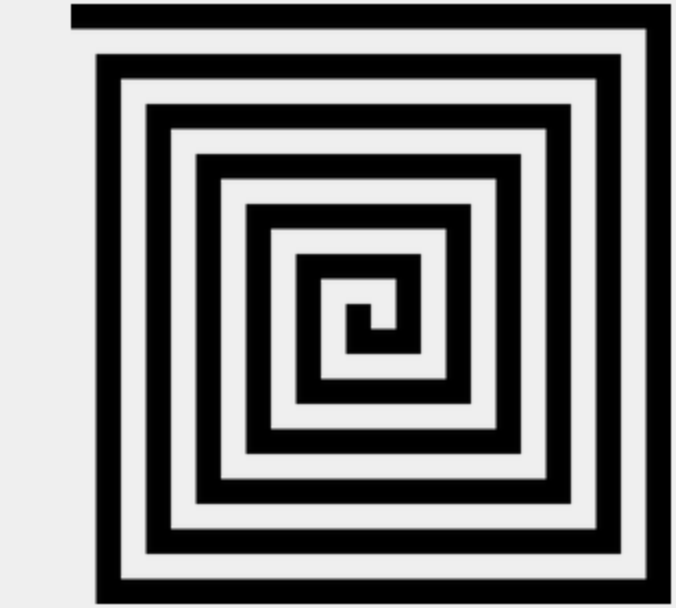


Fig 1. Chakravyuha

Chakravyuha

1	2	3	4	5
16	17	18	19	6
15	24	25	20	7
14	23	22	21	8
13	12	11	10	9

Fig 2. Army unit placements in Chakravyuha of size 5

Chakravyuha

Input
2
Output
1 2
4 3
Total Power points : 1
(0,0)

Input
5
Output
1 2 3 4 5
16 17 18 19 6
15 24 25 20 7
14 23 22 21 8
13 12 11 10 9
Total Power points : 3
(0,0)
(4,2)
(3,2)

Pseudo code

```
input n
powerpoints = 1 + (n * n / 11)
pp_list[2 * powerpoints]
pp_counter = 0
pp_list[pp_counter++] = 0
pp_list[pp_counter++] = 0
counter = 0
row = col = end_row = end_col = 0
for i = 0 to n / 2 - 1:
        row = col = i
        print top row
        print right column
        print bottom row
        print left column
If n % 2 == 1:
        print the last number
```

Pseudo code: Print top row

```
end_col = n - i - 1
while col < end_col:
        chakra[row][col] = ++counter
        if counter % 11 == 0:
                pp_list[pp_counter++] = row
                pp_list[pp_counter++] = col
        col++
```

Pseudo code: Print right column

```
end_row = n - i - 1
while row < end_row:
        chakra[row][col] = ++counter
        if counter % 11 == 0:
                pp_list[pp_counter++] = row
                pp_list[pp_counter++] = col
        row++
```

Pseudo code: Print bottom row

```
end_col = i
while col > end_col:
        chakra[row][col] = ++counter
        if counter % 11 == 0 :
                pp_list[pp_counter++] = row
                pp_list[pp_counter++] = col
        col--
```

Pseudo code: Print left column

```
end_row = i
while row > end_row:
        chakra[row][col] = ++counter
        if counter % 11 == 0:
                pp_list[pp_counter++] = row
                pp_list[pp_counter++] = col
        row--
```

Pseudo code: Print last number (odd)

```
if n % 2 == 1:
        chakra[n / 2][n / 2] = ++counter
        if counter % 11 == 0:
                pp_list[pp_counter++] = n / 2
                pp_list[pp_counter++] = n / 2
```

Queries?

Thank You…!