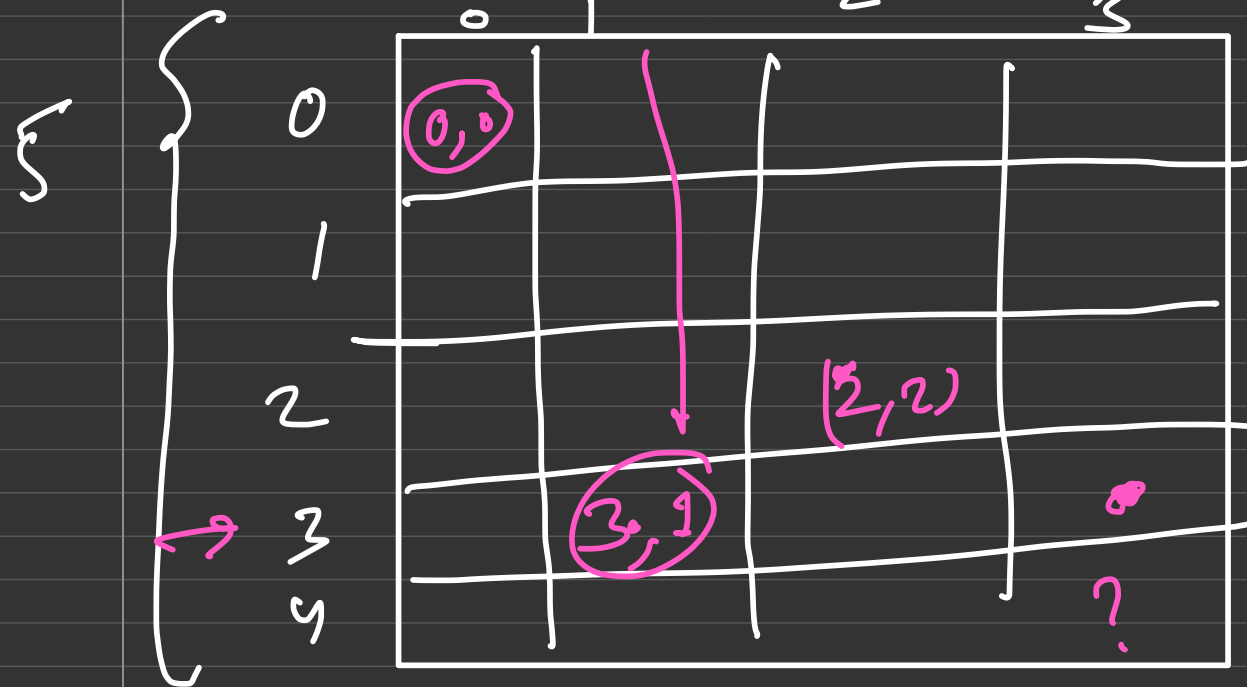


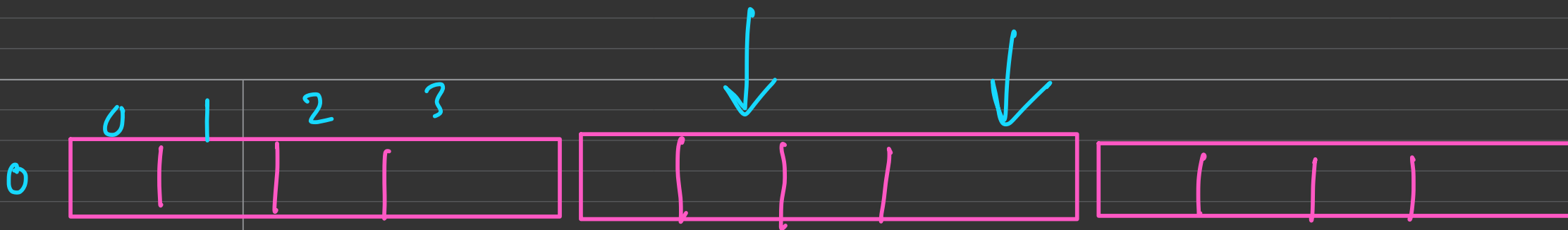
int ar [5][4];



5x4

ar [2][2]

ar [3,1]



1

2

ar [1] [1]
ar [1] [3]

3 x 4

5

```
for (int i=0; i<n; i++)  
{  
    for (int j=0; j<n; j++)  
    {  
        print(a[i][j]);  
    }  
}
```

$O(n \times n)$

3, 6, 2, 1, 7, 10, 16, 9, 15

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

13, 14, 12, 4, 5

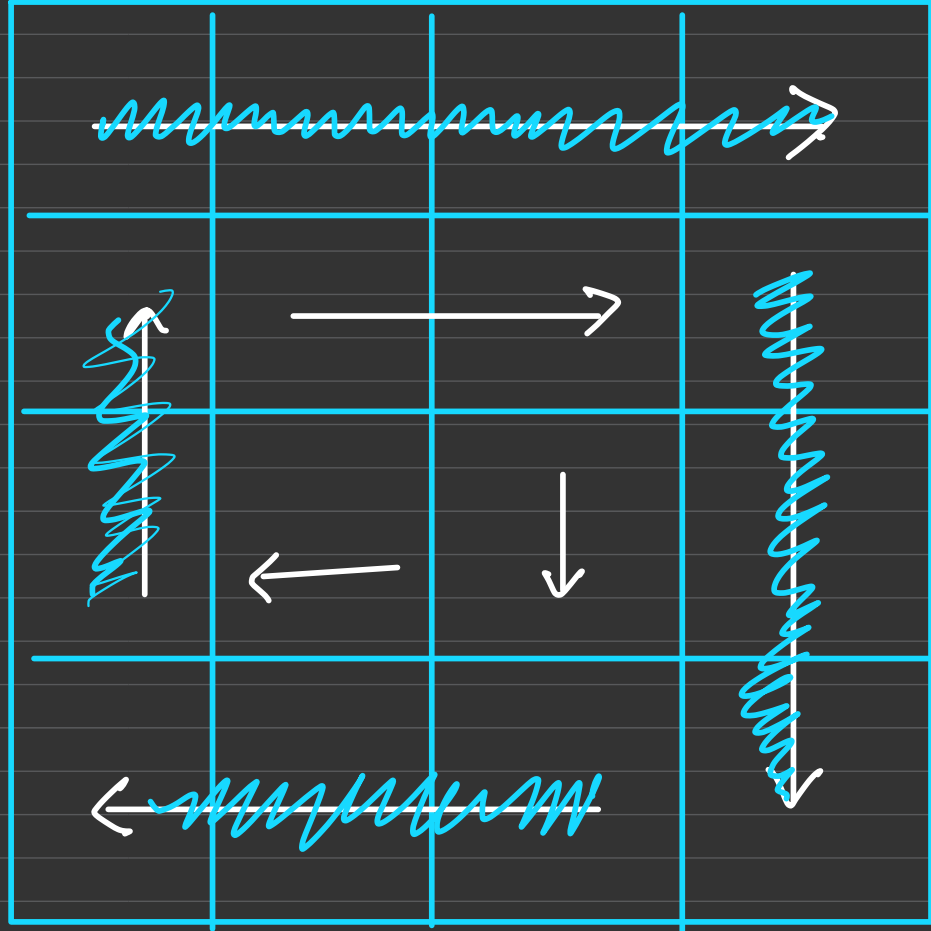
8, 11

left
↓

right
↓

top →

bottom →



- ① left to right
- ② top to bottom
- ③ right to left
- ④ bottom to top

```
for (i = left ; i <= right ; i++)  
{  
    arr[top][i] ;
```

```
}
```

```
top++;
```

```
for ( i = top ; i <= bottom ; i++ )  
{  
    ar [ i ] [ right ] ;  
  
}  
    right -- ;
```

```
for ( i = right ; i >= left ; i-- )  
{  
    ar [ bottom ] [ i ] ;  
  
}  
    bottom -- ;
```



```
for (i = bottom; i >= top; i--)
```

```
{    ar[i] [left];
```

```
    left ++;
```

```
while ( left <= right &&  
        top <= bottom )
```

```
{
```

```
    loop 1
```

```
    loop 2
```

```
    loop 3
```

```
    loop 4
```

```
}
```

$$O(m * n)$$

$$O(m * \log n)$$

$$O(n * \log n^2)$$

$$O(\log n + \log n)$$

$$O(m + n)$$

arr = { 3, 1, 3 }

$\log m + \log n$

$n = 6$
 $m = 5$

m { 10

0	1	2	3	4	5
0,0 1	0,1 4	0,2 6	0,3 10	0,4 15	0,5 20
6	7	8	9	10	11
35	42	48	49	70	72
12	13	14	15	16	17
80	85	87	89	95	100
18	19	20	21	22	23
102	108	182	190	192	200
24	25	26	27	28	29
201	222	232	245	268	290

→
→

182

$m + m$

$9 \rightarrow 1, 3$

$row = 9 / 6$

$col = 9 \% 6$

1D index

2D index

22



3, 4

row = element / no. of cols

col = element % no. of cols

$$22 / 6 = 3$$

$$22 \% 6 = 4$$

$$O\left(\frac{\log(m+n)}{1}\right)$$

$$m + n - 1$$

$$s = 0, e = 29$$

while ($s \leq e$)

{ int mid = $(s + e) / 2$;

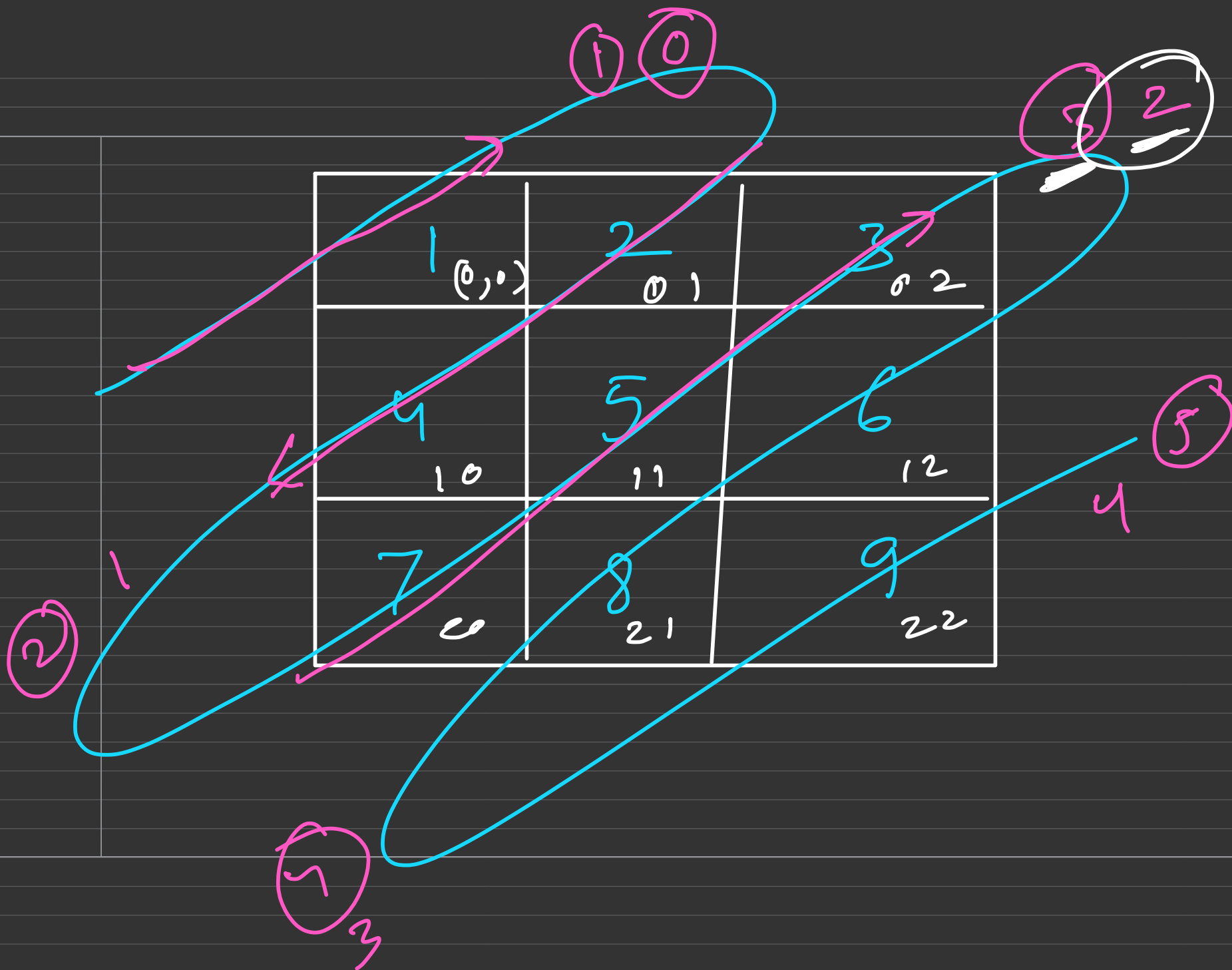
int element = ar[mid/n][mid%n]

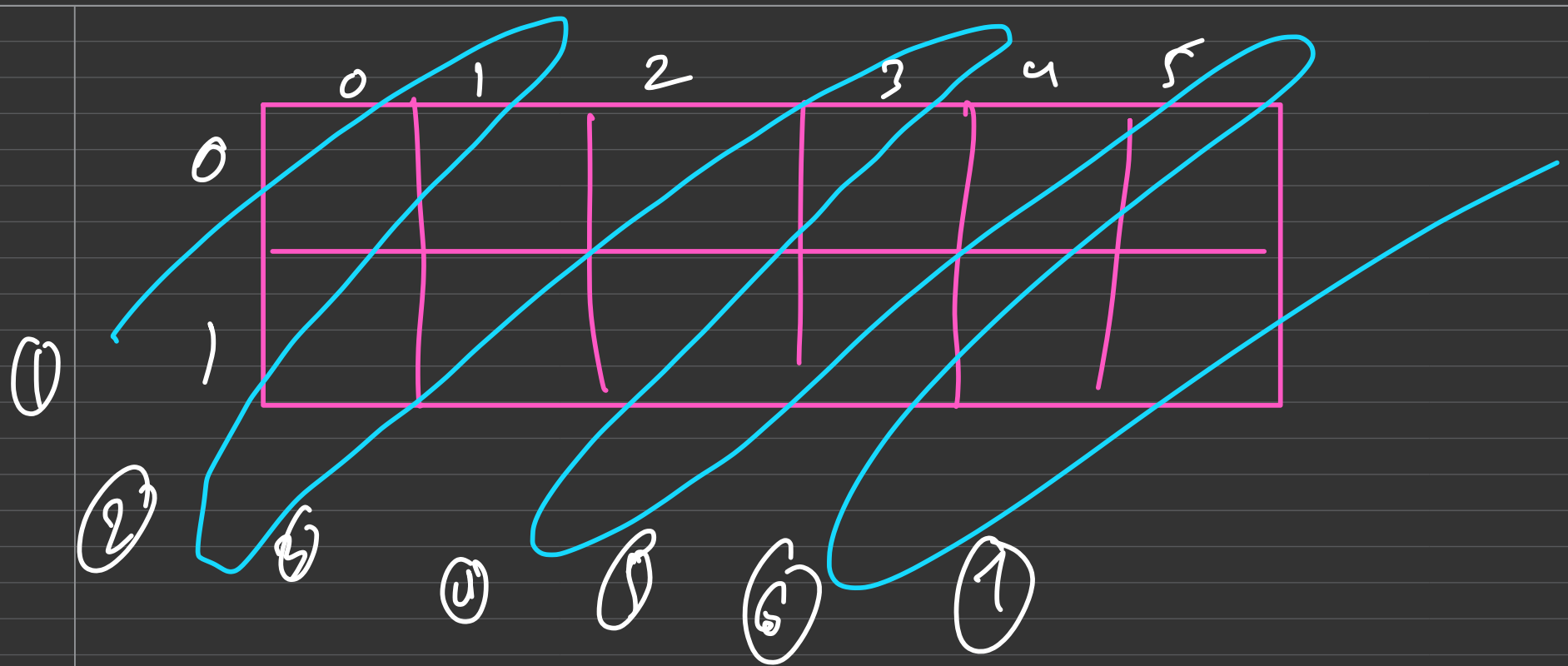
if (element == t) return

else if (element < t) $s = mid + 1$;

else $e = mid - 1$;

}





$$2 \times 6$$

$$6 + 2 - 1$$

$$\underline{\underline{i + j = d}}$$

for (int d = 0; d < m + n - 1; d++)

{

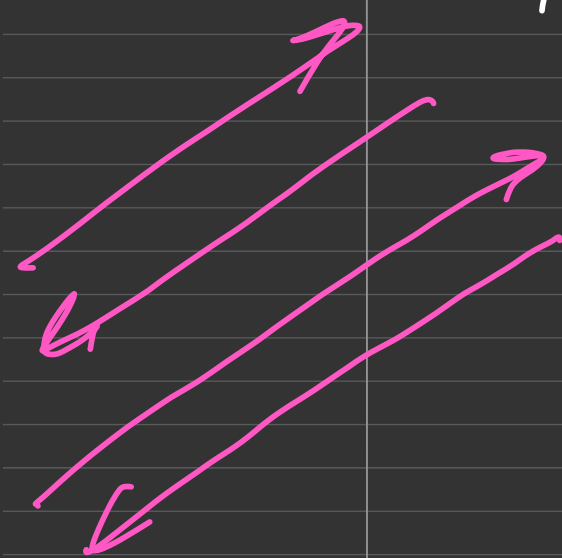
for (int i = 0; i <= d; i++)

{ j = d - i;

arr[i][j];

;

}



$$\checkmark \boxed{(0, 1)} (1, 1)$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & 1 \\ 1 & 3 & 1 \end{bmatrix}$$

\checkmark

$$O(m+n)$$

