Pattern Printing

Types of Patterns

1) Squares and Rectangles
2) Triangles and Horizontally Flipped triangles
3) Special Patterns
4) Composite Patterns

Prerequisites:

Loops

Ques : Print the given pattern

m rows , n cols

```
* * * * *
* * * * *
* * * * *
* * * * *
```

rows = no. of lines

cols = how much in each line

Star Rectangle

Ques : Print the given pattern

n = 4

User → n (side of square)

n = 3

Star Square

Ques : Print the given pattern

```
1 2 3 4
1 2 3 4
1 2 3 4
1 2 3 4
```

n = 4

n = 3

```
1 2 3
1 2 3
1 2 3
```

n = 6

```
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
```

Number Square

```java
for(int i=1;i<=n;i++){ // rows
    for(int j=1;j<=n;j++){ // cols
        System.out.print(i+" ");
    }
    System.out.println();
}
```

n = 5

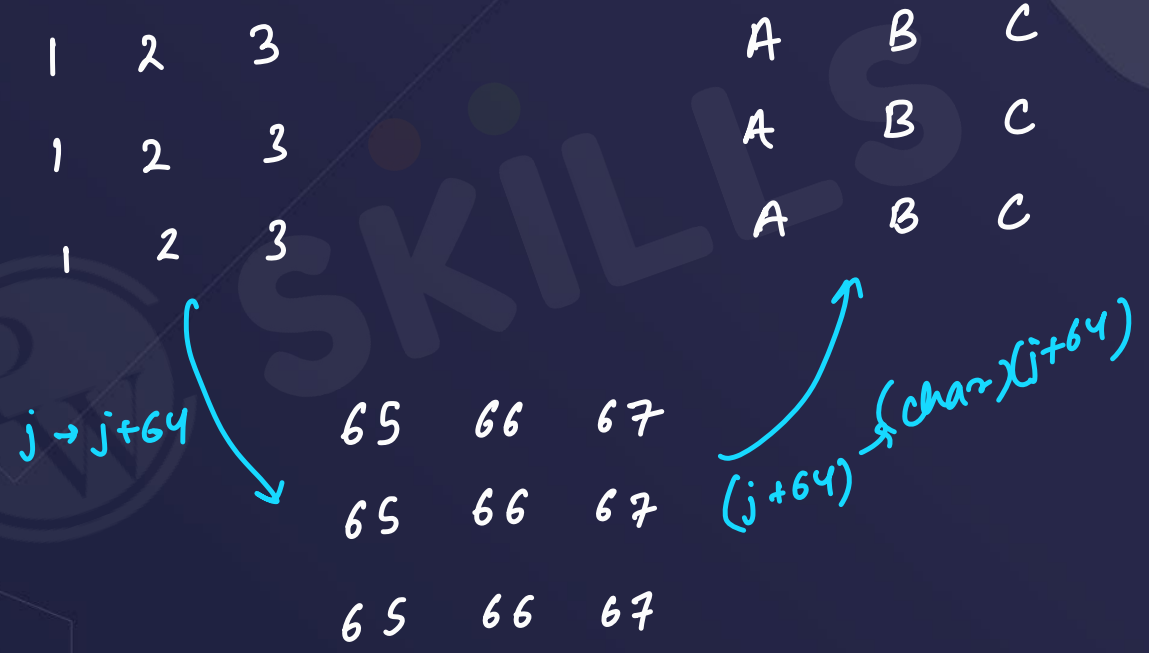
i = 1 → j = 1, 2, 3, 4, 5

i = 2 → j = 1, 2, 3, 4, 5

Ques: Print the given pattern

A B C D
A B C D
A B C D
A B C D

n = 4



Alphabet Square

'A' → 65
'B' → 66
.
.
.
'Z' → 90

'a' → 97
'b' → 98
.
.
.
'z' → 122

'0' → 48
'1' → 49
.
.
.
'9' → 57

HW - 1

n = 4

A A A A

B B B B

C C C C

D D D D

HW - 2

n = 3

a b c

a b c

a b c

Ques: Print the given pattern

Star Triangle

rows = n
cols = n

In the '* Δ' , in each line, the no of stars that are printed is equal to the row number

Ques: Print the given pattern

```
1
1 2
1 2 3
1 2 3 4
```

n = 4

n = 6

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
1 2 3 4 5 6
```

Number Triangle

HW : 1

n = 4

A

A B

A B C

A B C D

HW : 2

n = 5

1

2 2

3 3 3

4 4 4 4

5 5 5 5 5

* HW - 3

n = 5

```
1
A B
1 2 3
A B C D
1 2 3 4 5
```

n = 6

```
1
A B
1 2 3
A B C D
1 2 3 4 5
A B C D E F
```

Mixture Δ → Number Δ Alphabet

Ques: Print the given pattern

n = 4

n = 5

1 * * * * *

2 * * * *

3 * * *

4 * *

5 *

i = 1 → j = 1 to 5

i = 2 → j = 1 to 4

i = 3 → j = 1 to 3

i = 4 → j = 1 to 2

i = 5 → j = 1 to 1

$i + j_{max} = n + 1$

$j_{max} = n + 1 - i$

$j <= n + 1 - i$

Star Triangle Reverse

```
for (i=1 to n)
  for( j=1 to n)
```

```
for(i=1 to n)
  for(j=1 to i)
```

```
for (i=1 to n)
  for(j=1 to  n+1-i)
```

H.W. 1

n=4

1 2 3 4
1 2 3
1 2
1

H.W: 2

n=5

A A A A A
B B B B
C C C
D D
E

Ques: Print the given pattern

```
1
1 3
1 3 5
1 3 5 7
```

n = 4

n = 5

```
1
1 3
1 3 5
1 3 5 7
1 3 5 7 9
```

: Hint

j = 1, 2, 3, 4, 5, ...

2j-1 = 1, 3, 5, 7, 9

Odd Number Triangle

Method - 2

Q// Print first 'n' numbers of this AP :

1, 3, 5, 7, 9 . . . .

$a_n = 1 + (n-1) \cdot 2 = 2n - 1$

```
{
for(int j=1 ; j<= 2*n-1 ; j+=2){
    sout(j);
}
```

Ques: Print the given pattern

1 1
2 2 3
3 4 5 6
4 7 8 9 10

n= 4

n= 3

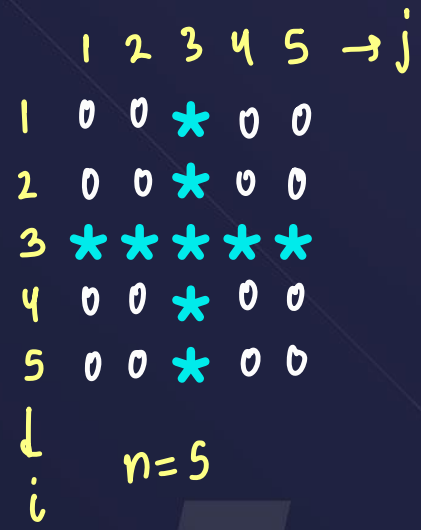
1 1
2 2 3
3 4 5 6

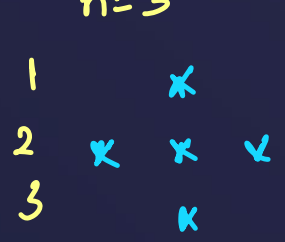
n= 5

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

Floyd's Triangle

Ques: Print the given pattern (n is odd)

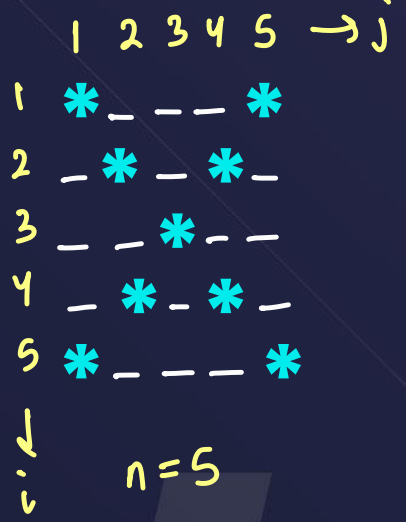




$$mid = \frac{n}{2} + 1$$

Star Plus

Ques: Print the given pattern (n is odd)



if(i==j || i+j==n+1) → *

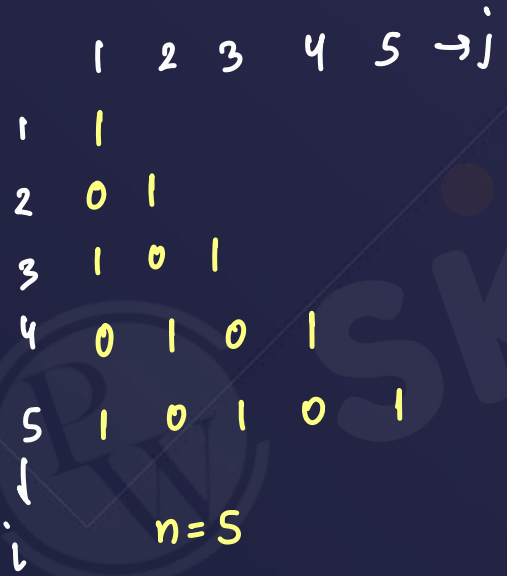
else → _

Star Cross

*Ques: Print the given pattern

1 1
2 0 1
3 1 0 1
4 0 1 0 1

n = 4




```
if(i%2 == 1){
    if(j%2==1) → 1
    else → 0
}
else { //i%2==0
    if(j%2==0) → 1
    else → 0
}
```

Binary Triangle

*Ques: Print the given pattern

```
_ _ _ *
_ _ * *
_ * * *
* * * *
```

n = 4

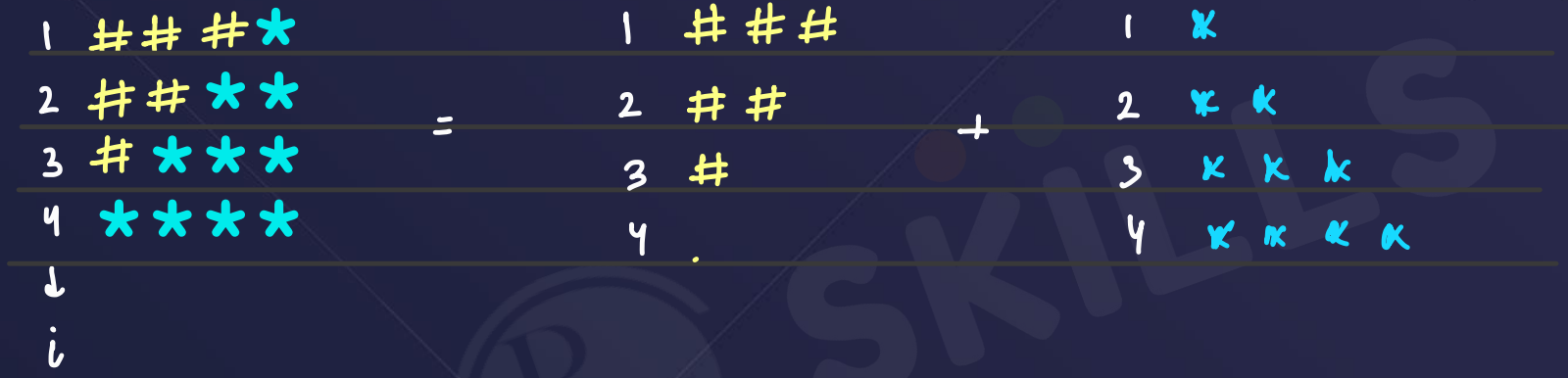
Ex ⇒ n = 5

if (i+j > n) → *
else –

Star Triangle Flipped

*Ques: Print the given pattern

n=4



2 Loops inside 1 Loop

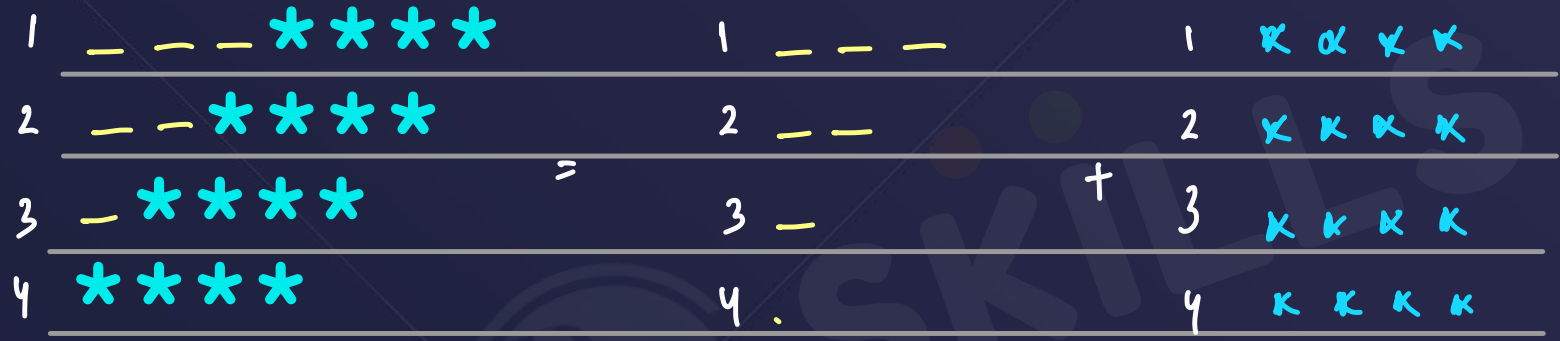
Star Triangle Flipped

Ques: Print the given pattern

```
   1
  1 2
 1 2 3
1 2 3 4
```

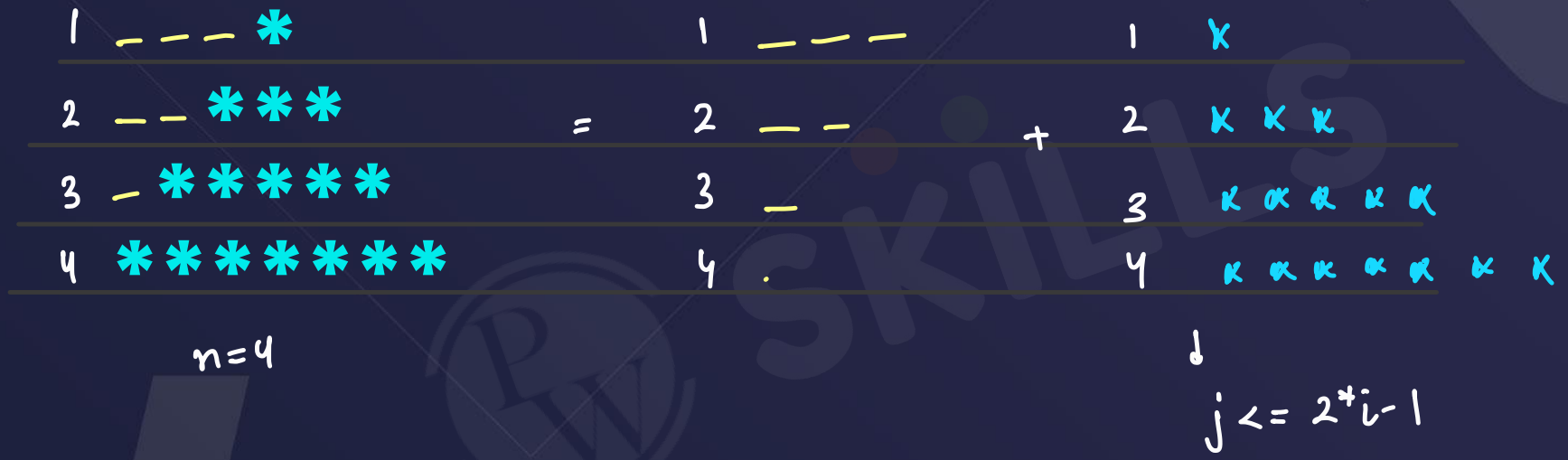
Number Triangle Flipped

*Ques : Print the given pattern



Rhombus

*Ques : Print the given pattern



Star Pyramid

*Ques : Print the given pattern

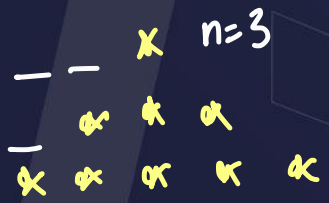
M-2 : Extra Variables

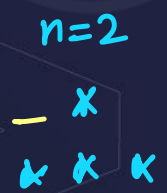
n=4

```
1 ___*
2 __***
3 _*****
4 *******
d
i
```

```
nsp = n-1;
nst = 1;
```

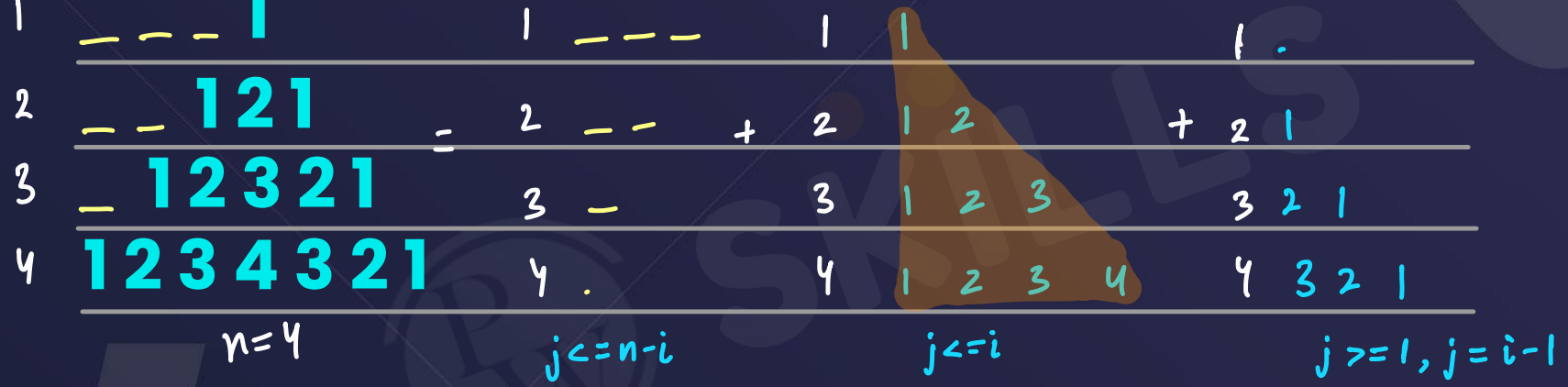
```
nsp--
nst +=2
```





Star Pyramid

Ques : Print the given pattern



Number Pyramid Palindrome

Ques : Print the given pattern

n=4

~~n=n-1=3~~

n--;

nsp=1 , nsp+=2

Star Bridge

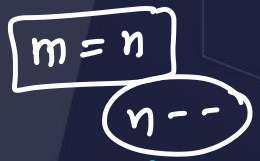
*Ques : Print the given pattern

```
  1 2 3 4 5 6 7
1 1 2 3 _ 5 6 7
2 1 2 _ _ _ 6 7
3 1 _ _ _ _ _ 7
```

n=5

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

n=3



Number Bridge

*Ques : Print the given pattern

nsp = n-1 , nsp--
nst = 1 , nst +=2

nsp = 1 , nsp++
nst = (?) , nst -=2
↓
nst -= 4

n = 1

*

n = 2

*
* * *
*

n = 3

*
* * *
* * * * *
* * *
*

Star Diamond

**Ques : Print the given pattern

```
4 4 4 4 4 4 4
4 3 3 3 3 3 4
4 3 2 2 2 3 4
4 3 2 1 2 3 4
4 3 2 2 2 3 4
4 3 3 3 3 3 4
4 4 4 4 4 4 4
```

n = 4

```
2 2 2
2 1 2
2 2 2
```

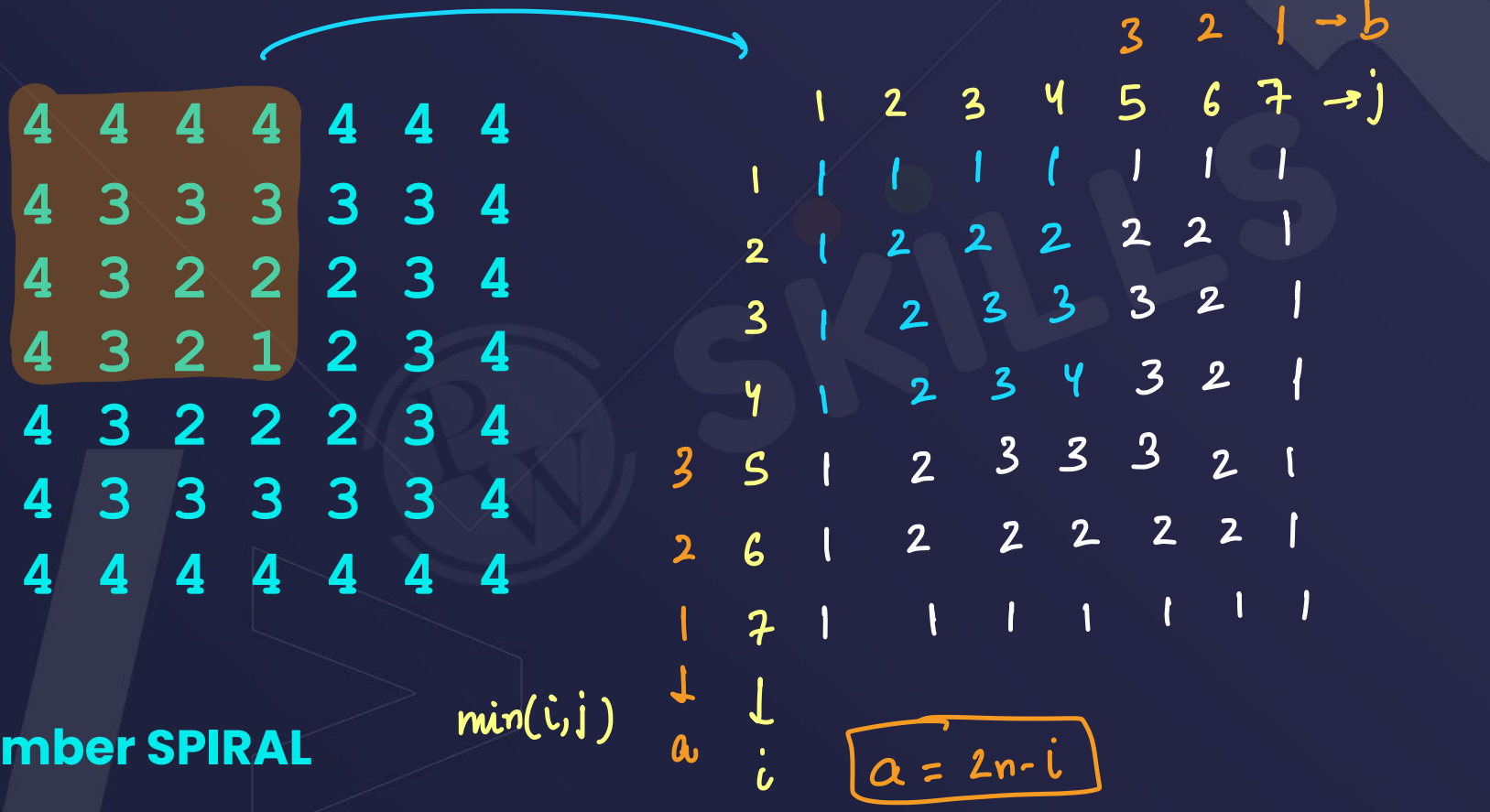
n = 2

```
3 3 3 3 3
3 2 2 2 3
3 2 1 2 3
3 2 2 2 3
3 3 3 3 3
```

n = 3

Number SPIRAL

**Ques : Print the given pattern



**Ques : Print the given pattern

```
4 4 4 4 4 4 4
4 3 3 3 3 3 4
4 3 2 2 2 3 4
4 3 2 1 2 3 4
4 3 2 2 2 3 4
4 3 3 3 3 3 4
4 4 4 4 4 4 4
```

```
1 1 1 1 1 1 1
1 2 2 2 2 2 1
1 2 3 3 3 2 1
1 2 3 4 3 2 1
1 2 3 3 3 2 1
1 2 2 2 2 2 1
1 1 1 1 1 1 1
```

$K = n+1 - \min(a,b)$

$n = 4$

$\min(a,b)$

$K + \min(a,b) = n+1$

Number SPIRAL

What’s in the next lecture?

A head start to modern programming: Arrays!

What’s in the next lecture?

More patterns!

More interesting and with more fun!