

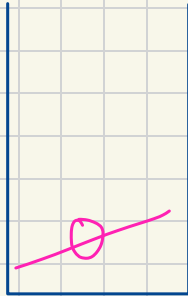


stock span.

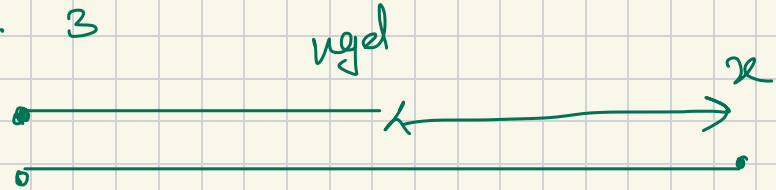
TC: $O(N)$
SC: $O(N)$ } ✓

int[] arr = {⁰100, ¹80, ²90, ³95}

int[] ngeli =
-1 0 0 0
1 1 2 3



Stack



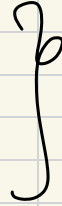
$$\text{distance} = [x - \text{ngeli}]$$

{ people looking ngeli }

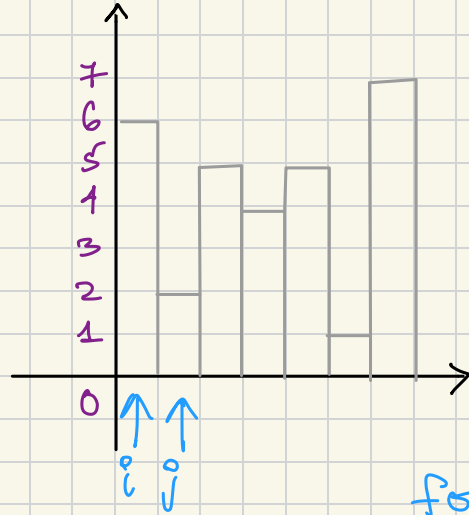
Next greater element on left

Agenda。

- Largest Area Histogram
- Celebrity problem
- Infix and postfix Evaluation



Largest Area Histogram



Brute Force

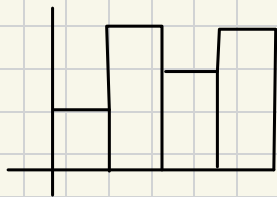
TC: $O(N^2)$
SC: $O(1)$

Which rectangle in this histogram has the largest area

hist[] = {6, 2, 5, 4, 5, 1, 7}

```
for (int i = 0; i < n; i++)  
{  
    int minHeight = +∞;  
    for (int j = i; j < n; j++)
```

```
    {  
        minHeight = min(minHeight, hist[j]);  
        maxArea = max(maxArea, minHeight * (j - i + 1));  
    }  
}
```



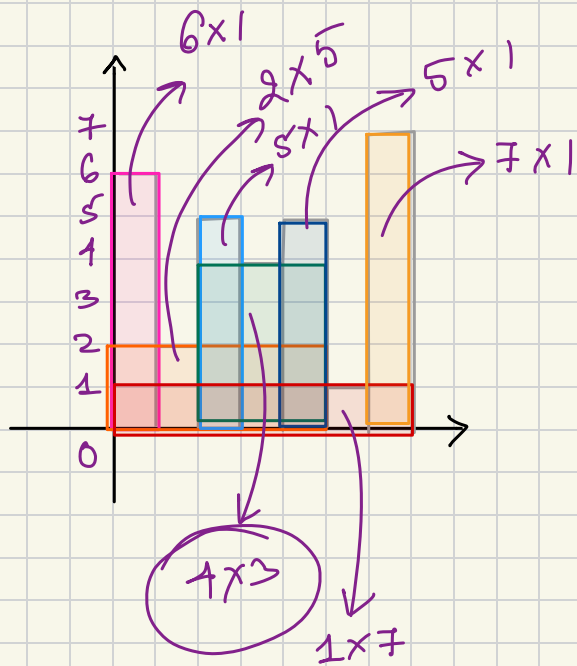
$$\text{hist}[i] = \{ \overset{0}{1}, \overset{1}{3}, \overset{2}{2}, \overset{3}{3} \}$$

\uparrow i
 \uparrow j

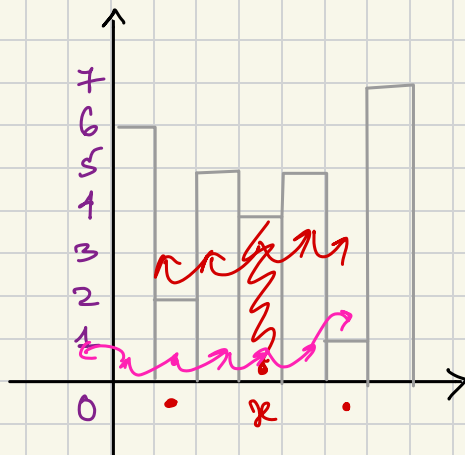
$$\text{max Area} = -\cancel{10} \cancel{12} \cancel{23} \cancel{18} 6$$

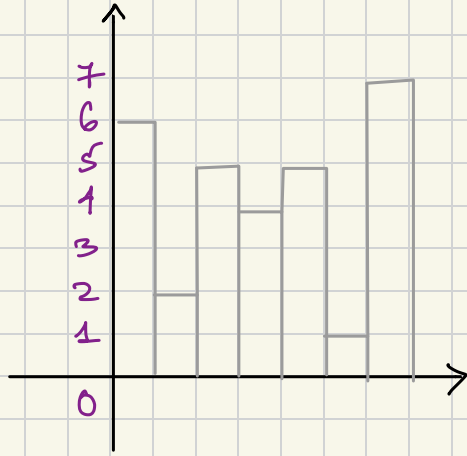
$$\text{min Height} = \cancel{0} \cancel{2}$$

$$2 \times (3 - 1 + 1) = 6$$



next smaller element on left }
and right }





$$\text{hist}[i] = \{ \overset{0}{6}, \overset{1}{2}, \overset{2}{5}, \overset{3}{4}, \overset{4}{5}, \overset{5}{1}, \overset{6}{7} \}$$

$$\text{use r}[i] = \{ 1, 5, 3, 5, 5, 7, 7 \}$$

$$\text{use l}[i] = \{ -1, -1, 1, 1, 3, -1, 5 \}$$

\downarrow
1

\downarrow
5

\downarrow
1

\downarrow
3

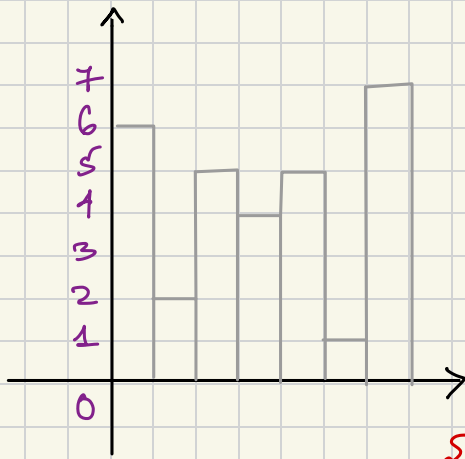
\downarrow
1

\downarrow
7

\downarrow
1

$$\{ \text{width} = \text{use r}[i] - \text{use l}[i] - 1 \}$$

$$\text{Area} = \text{width} \times \text{hist}[i]; \checkmark$$



$\{r-l-1\}$

1. Calc. need l

2. Calc. need r

3. Calc. width \times height

store max Area

$\{l\}$

$\{r\}$

}

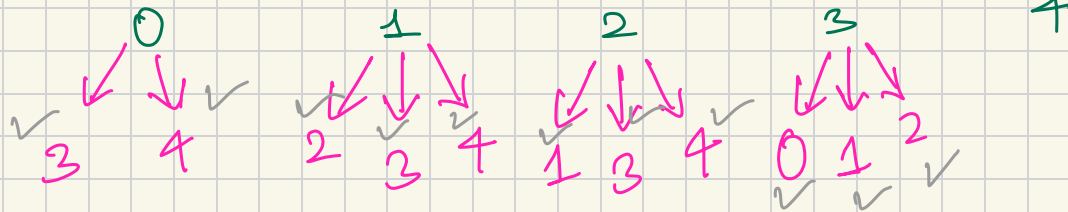
Celebrity Problem

int[][] arr =

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

$n \times n$

Inviting n people:



$arr[i][j] = 1$
i knows *j*
 $arr[i][j] = 0$
i doesn't know *j*

celeb?

- ① is a person known by everyone
- ② doesn't know anyone

NOTE: Can there be more than one celeb?

No!

int[][] arr =

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

$n \times n$

Identify celeb and return, if no such celeb return -1.

int[][] arr =

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

$n \times n$

Brute Force

for each check
row and col

TC: $O(N \times N) \approx O(N^2)$
SC: $O(1)$

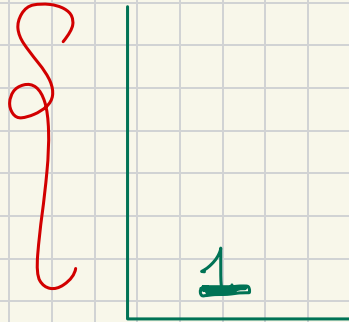
$x \rightarrow$ is known by everyone : Col should be 1
 $x \rightarrow$ doesn't know anyone : Row should be 0

int[][] arr = 0

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

$n \times n$

1, ~~2~~



potential cells

a b c d e
 $(n-1)$ pairs
 $+ O(N)$ row
 $+ O(N)$ col
 $\frac{O(N)}{O(N)}$
 $SC: O(N)$

1, ~~2~~
~~2~~, 1
 1, ~~2~~

