

Next Greater Element!

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

next greater of 8 is out of bound.

ans: 2 2 3 6 6 6 8 8

①

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

for (int i = n-1; i >= 0; i--)

{ while (!st.empty() && nums[i] > nums[st.top()])
st.pop();
if (st.empty()) ngr[i] = -1;
else ngr[i] = st.top();
st.push(i); }

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

7

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

6

check ans[i] > ans[st.top()]
then pop st.
while !st.empty.

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

5

ans[i] < ans[st.top()]
ngr[i] = st.top();

add lower values for future occurrences.

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

4

p.p until the stack top
is greater than 8.

ans[6] > ans[3]

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

3

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

2

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

1

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

0

0 1 2 3 4 5 6 7
2 1 3 5 1 1 8 2

6

Fill remaining part by
ans.size

②

another way:

for (int i = 0; i < n; i++) {
while (!st.empty() && nums[i] > nums[st.top()]) {
ngr[st.top()] = i;
st.pop();
st.push(i);
}

pop +
write

push

st.push(i);

e.g: 0 1 2 3 4 5 6 7
6 3 2 1 5 7

ngr [-1] [1] [2] [3] [4] [5]
4 4 4

next ngr[5] = 7;

5 4 4 4 4 5

4
3
2
1
0

7
4
0

5 7's index

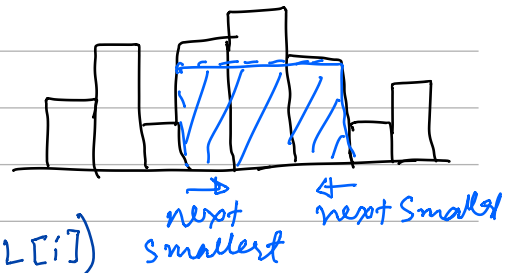
4
3
2
1
0

nums[9] = 7's index
= 5

○ Stock Span

○ Maximum Area Histogram:

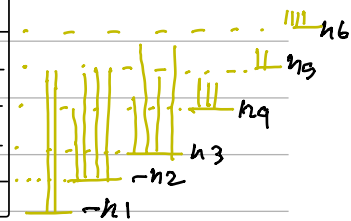
$$ans = \max(ans, arr[i] \times (NSR[i] - NSL[i]))$$



○ Maximum Area Rectangle :

$$ans = \max(\maxAreaHistogram(h_1), \maxAreaHistogram(h_2), \dots, \maxAreaHistogram(h_6))$$

1	1	0	1	0	1
1	1	1	0	1	1
0	0	1	1	1	0
0	1	1	1	1	0
1	1	1	1	1	1
0	0	0	1	1	0



○ Trapping of Water :-

$$arr: [3, 0, 0, 2, 0, 4]$$

$$greaterL: 3, 3, 3, 3, 3, 4$$

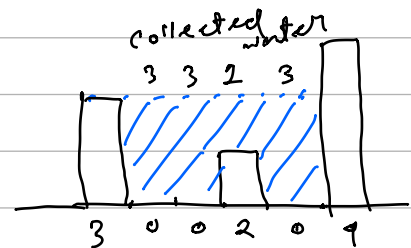
$$greaterR: 4, 4, 4, 4, 4, 4$$

$$\min(greaterL, greaterR): 3, 3, 3, 3, 3, 4$$

$$- 3, 0, 0, 2, 0, 4$$

$$= 0, 3, 3, 1, 3, 0$$

$$\text{Total water collected} = 3 + 3 + 1 + 3 = 10$$

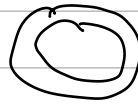
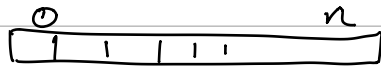


○ min Stack : $O(1)$ space Trick :

$$Stack.push(2 \times val - minElement)$$

$$minElement = 2 \times minElement - St.top()$$

○ Next Greater Element in Circular array :-



instead $\text{for}(i = n-1; i \geq 0; i--)$

we $\text{for}(i = 2n, i \geq 0; i--)$

$\text{idx} = i \% n;$