

Subarray Minima

16	72	17	57	3	28	109	23	1	15	30	47	22	35	7	9	180	18
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Q: What is index of minimum value in subarray $A[l, r]$?

Alg: Two-finger method

Running Time: $O(n)$ (or $O(r-l+1)$)

↑ what if $\exists \Omega(n^2)$ queries?

Suppose the array is **STATIC**

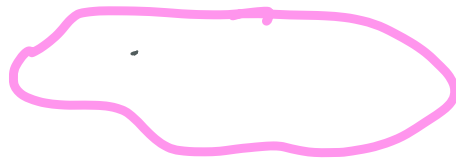
Can you trade off some preprocessing for faster query time?

Alg: LookUp $[0..n-1, 0..n-1]$

Preprocess:

for $i = 0..n-1$

LookUp $[i, i] = \underline{i}$



Query: return LookUp $[l, r]$

Running Time: $\Theta(n^2)$ preprocessing, $\Theta(1)$ query time.

Note: return the index, not the value.

index \rightarrow value conversion is _____

value \rightarrow index conversion is _____

But for the simplicity of our pseudocode, let's pretend we are returning values

Running Time goals: $O(n^2)$ preprocessing, $O(n)$ query time

Alg: Preprocessing

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