Solved Problem - Reverse Subarray

In this lesson, we'll discuss a solved problem about how to reverse the given subarray of an array.

We'll cover the following

Problem statement

Given an array A of N integers. Answer Q queries of the type (l, r) - reverse the subarray $A[l...r]$. Print the array after each query.

Input format The first line contains two integers N and Q $(1 \leq N, Q \leq 10^3)$.

The second line contains N space-separated integers representing the array $A[]$ $(1 \leq A[i] \leq 10^6)$.

Next, Q lines each contains pair of integers l and r $(1 \leq l \leq r \leq N)$.

Sample

Input

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

Output

```
5 4 3 2 1
```

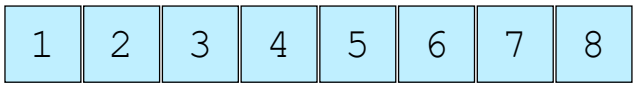
```
5 3 4 2 1
5 3 1 2 4
```

Solution

For each query, we can reverse the given array in $O(N)$ time. Let's see how we would reverse the entire array; we can then do the same to reverse a subarray.

We start with two pointers, one at the start and one at the end of the array. Pointer 1 moves to the right and Pointer 2 moves to the left after each step. At each step, we swap the elements at the two pointers.

See the below illustrations for better understanding.



Start with 2 pointers

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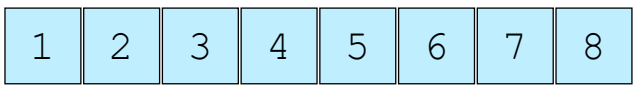

One at the start

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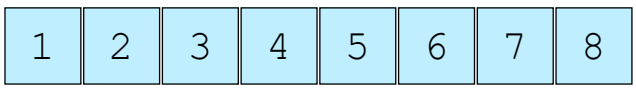

One at the end

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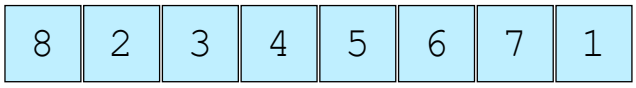

Swap the elements

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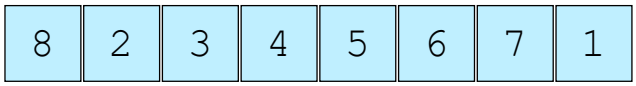

Move the pointers closer 1 step

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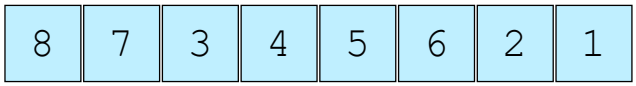

Repeat

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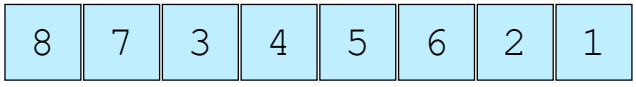

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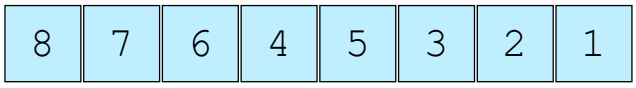

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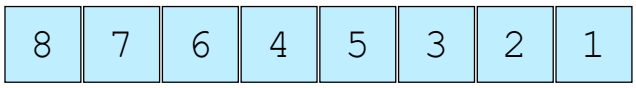

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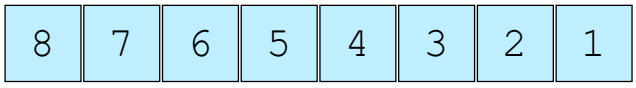

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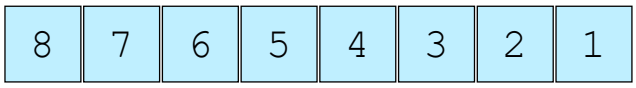

Stop once the pointers cross each other

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main.cpp

input.txt

All code files are copied to end of the page...

Time complexity

The time complexity for one query is $O(N)$. The total time complexity of the solution is $O(Q * N)$, which works for the given constraints.

In the next lesson we'll discuss a similar problem, rotating an array.

Code Files Content !!!

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```
------------------------------------------------------------------------
|  main.cpp [1]
------------------------------------------------------------------------


#include
#include
#include
using namespace std;

int main() {
  ifstream cin("input.txt");

  int N, Q;
  cin >> N >> Q;
  vector A(N, 0);
  for (int i = 0; i < N; i ++)
    cin >> A[i];

  for(int i = 0; i < Q; i++) {
    int l, r;
    cin >> l >> r;
    l --; r --; // covert to 0-based index

    for(int p1 = l, p2 = r; p1 < p2; p1++, p2--){
      swap(A[p1], A[p2]);
    }
  }

  for (int i = 0; i < N; i++) cout << A[i] << " "; cout << "\n";
```

```
  return 0;
}



--------------------------------------------------------------------------------
|  input.txt [1]
--------------------------------------------------------------------------------


5 3
1 2 3 4 5
1 5
2 3
3 5




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