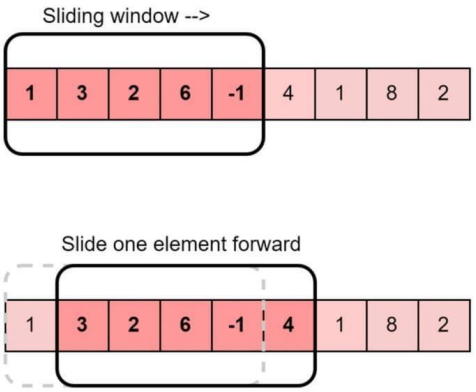
1. Sliding Window

Usage: This algorithmic technique is used when we need to handle the input data in a specific window size.

DS Involved: Array, String, HashTable



Sample Problems:

- Longest Substring with 'K' Distinct Characters
- Fruits into Baskets

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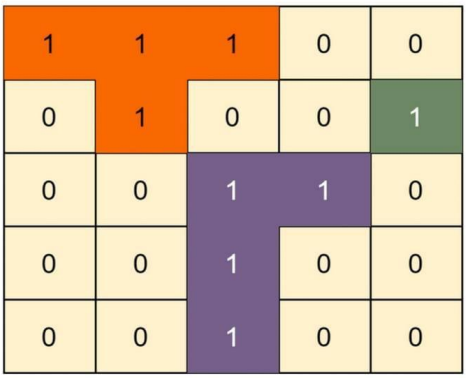
2. Islands (Matrix Traversal)

Usage: This pattern describes all the efficient ways of traversing a matrix (or 2D array).

DS Involved: Matrix, Queue



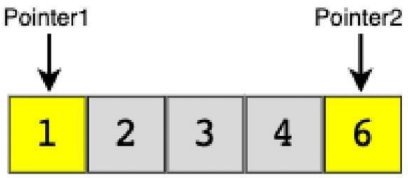
Sample Problems:

- Number of Islands
- Flood Fill
- Cycle in a Matrix

3. Two Pointers

Usage: This technique uses two pointers to iterate input data. Generally, both pointers move in the opposite direction at a constant interval.

DS Involved: Array, String, LinkedList



Sample Problems:

- Squaring a Sorted Array
- Dutch National Flag Problem
- Minimum Window Sort

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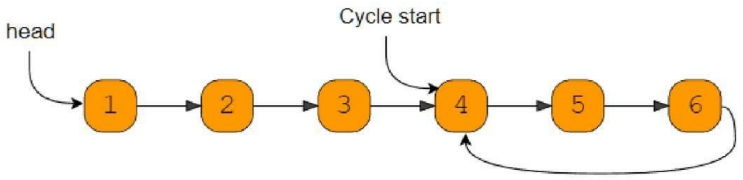
4. Fast & Slow Pointers

Usage: Also known as Hare & Tortoise algorithm. This technique uses two pointers that traverse the input data at different speeds.

DS Involved: Array, String, LinkedList



Sample Problems:

- Middle of the LinkedList
- Happy Number
- Cycle in a Circular Array

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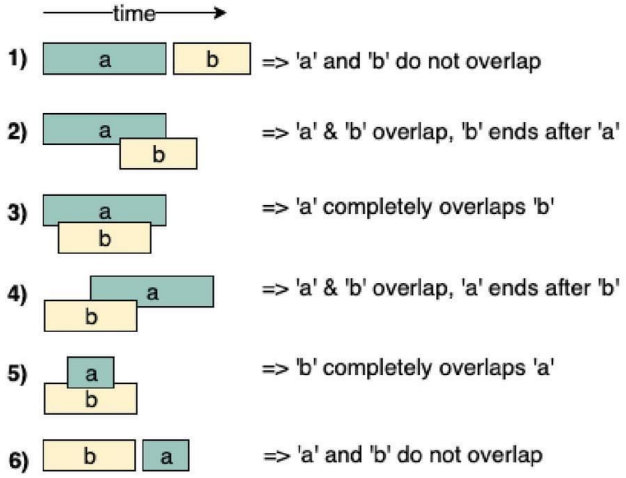
5. Merge Intervals

Usage: This technique is used to deal with overlapping intervals.

DS Involved: Array, Heap



Sample Problems:

- Conflicting Appointments
- Minimum Meeting Rooms

6. Cyclic Sort

Usage: Use this technique to solve array problems where the input data lies within a fixed range.

DS Involved: Array

Sample Problems:

- Find all Missing Numbers
- Find all Duplicate Numbers
- Find the First K Missing Positive Numbers

7. In-place Reversal of a LinkedList

Usage: This technique describes an efficient way to reverse the links between a set of nodes of a LinkedList. Often, the constraint is that we need to do this in-place, i.e., using the existing node objects and without using extra memory.

DS Involved: LinkedList

Sample Problems:

- Reverse every K-element Sub-list
- Rotate a LinkedList

8. Breadth-First Search

Usage: This technique is used to solve problems involving traversing trees or graphs in a breadth-first search manner.

DS Involved: Tree, Graph, Matrix, Queue

Sample Problems:

- Binary Tree Level Order Traversal
- Minimum Depth of a Binary Tree
- Connect Level Order Siblings

9. Depth First Search

Usage: This technique is used to solve problems involving traversing trees or graphs in a depth-first search manner.

DS Involved: Tree, Graph, Matrix

Sample Problems:

- Path With Given Sequence
- Count Paths for a Sum

10. Two Heaps

Usage: In many problems, we are given a set of elements that can be divided into two parts. We are interested in knowing the smallest element in one part and the biggest element in the other part. As the name suggests, this technique uses a Min-Heap to find the smallest element and a Max-Heap to find the biggest element.

DS Involved: Heap, Array

Sample Problems:

- Find the Median of a Number Stream
- Next Interval

11. Subsets

Usage: Use this technique when the problem asks to deal with permutations or combinations of a set of elements.

DS Involved: Queue, Array, String

Sample Problems:

- String Permutations by changing case
- Unique Generalized Abbreviations

12. Modified Binary Search

Usage: Use this technique to search a sorted set of elements efficiently.

DS Involved: Array

Sample Problems:

- Ceiling of a Number
- Bitonic Array Maximum

13. Bitwise XOR

Usage: This technique uses the XOR operator to manipulate bits to solve problems.

DS Involved: Array, Bits

Sample Problems:

- Two Single Numbers
- Flip and Invert an Image

14. Top ‘K’ Elements

Usage: This technique is used to find top/smallest/frequently occurring ‘K’ elements in a set.

DS Involved: Array, Heap, Queue

Sample Problems:

- ‘K’ Closest Points to the Origin
- Maximum Distinct Elements

15. K-way Merge

Usage: This technique helps us solve problems that involve a list of sorted arrays.

DS Involved: Array, Queue, Heap

Sample Problems:

- Kth Smallest Number in M Sorted Lists
- Kth Smallest Number in a Sorted Matrix

16. Topological Sort

Usage: Use this technique to find a linear ordering of elements that have dependencies on each other.

DS Involved: Array, HashTable, Queue, Graph

Sample Problems:

- Tasks Scheduling
- Alien Dictionary

17. 0/1 Knapsack

Usage: This technique is used to solve optimization problems. Use this technique to select elements that give maximum profit from a given set with a limitation on capacity and that each element can only be picked once.

DS Involved: Array, HashTable

Sample Problems:

- Equal Subset Sum Partition
- Minimum Subset Sum Difference

18. Fibonacci Numbers

Usage: Use this technique to solve problems that follow the Fibonacci numbers sequence, i.e., every subsequent number is calculated from the last few numbers.

DS Involved: Array, HashTable

Sample Problems:

- Staircase
- House Thief

19. Palindromic Subsequence

Usage: This technique is used to solve optimization problems related to palindromic sequences or strings.

DS Involved: Array, HashTable

Sample Problems:

- Longest Palindromic Subsequence
- Minimum Deletions in a String to make it a Palindrome

20. Longest Common Substring

Usage: Use this technique to find the optimal part of a string/sequence or set of strings/sequences.

DS Involved: Array, HashTable

Sample Problems:

- Maximum Sum Increasing Subsequence
- Edit Distance