**Linkedlist apporach**

1. Dummy node

**Two poitner technique here**

1. Reduce tc from O(n^2) to O(nlogn)

2. Space efficient too

3. Can be applied to two sum, sorting and merging array or lists,

**string manipulation:**

finding substring, or performing in-place replacements

**Problems Solved with Two Pointers**

Two Pointers can tackle an array of problems. Here are some common categories:

**1. Searching and Summation**

* Two Sum Problem: Given an array, find two numbers that add up to a specific target sum.

**2. Array Manipulation**

* Container With Most Water: Find two lines in an array of heights that form a container with the most water.

**3. List Manipulation**

* Reverse a String or List: Efficiently reverse a string, array, or linked list.

**4. Linked List Algorithms**

* Linked List Cycle Detection: Detecting a cycle in a linked list can be achieved using Two Pointers (Floyd’s Tortoise and Hare algorithm).

**5. Sorting and Merging**

* Merge Sorted Arrays or Lists: Merge two sorted arrays or linked lists efficiently.

**6. String Manipulation**

* Many string manipulation problems, such as checking for palindromes, finding sub-strings, or performing in-place replacements, can benefit from Two Pointers.

**Using bitmap manipulation**

1. it’s better to use java for this since there is an overflow condition

You can do carry, xor and and opeartor

2. If just use the typical one willl cause overflow here

xor

Graph technique 1 here:

Use this to cover the topic given above here

Using the bfs solution above here: makes a lot of sense here

while q and fresh > 0:

for i in range(len(q)):

r, c = q.popleft()

This is one of the porblme that’s worked on here

1. So basically what we have is the following

Technique 0:

Prefix sum + hashmap:

Technique #1:

TWhen to use the parent pointer

Parent pointers are helpful to quickly find ancestors of a node, LCA of two nodes, successor of a node, etc.

In recursive calls of simple insertion, we return pointer of root of subtree created in a subtree. So the idea is to store this pointer for left and right subtrees.

1. In this case we are creating a new node here, which has 3 fields

key, left and parent

2.

1. Using a trie sometimes is good for word:

# of distinct substring in a string lt

Using parent pointers here

1.