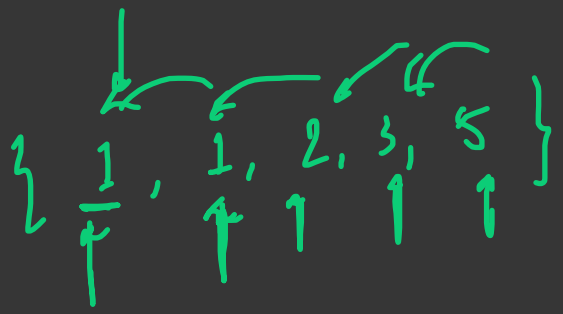
Find the Duplicate element in array

arr[] = { 2, 1, 3, 1, 5 }

Brute force:

Sort



val = 1

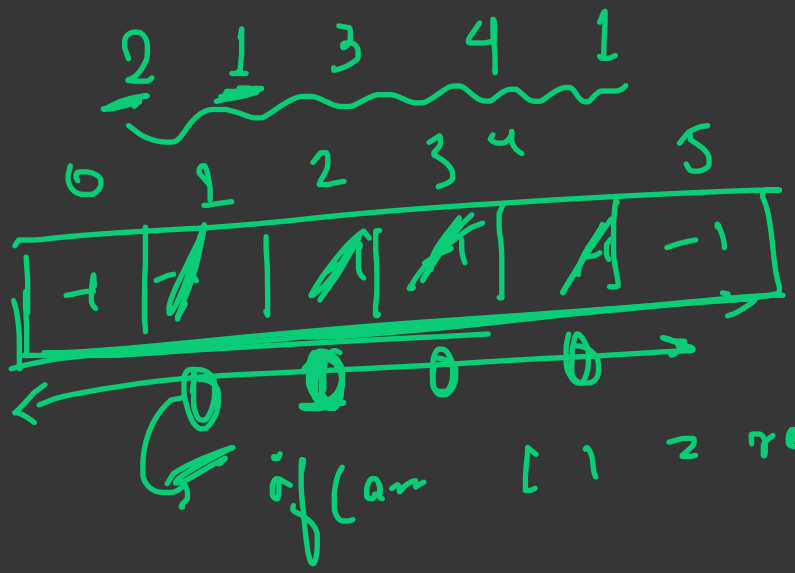
1 ✓

check prev == ; if equal return the element

or else return -1.

T.C. : O(N log N) + O(N)

Better 1 element repeating



O(2N) but S.C: O(N)

T.C. = O(N)

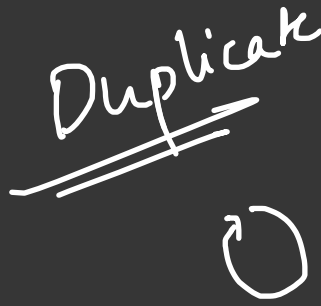
S.C = O(N) → Need to optimised on per question

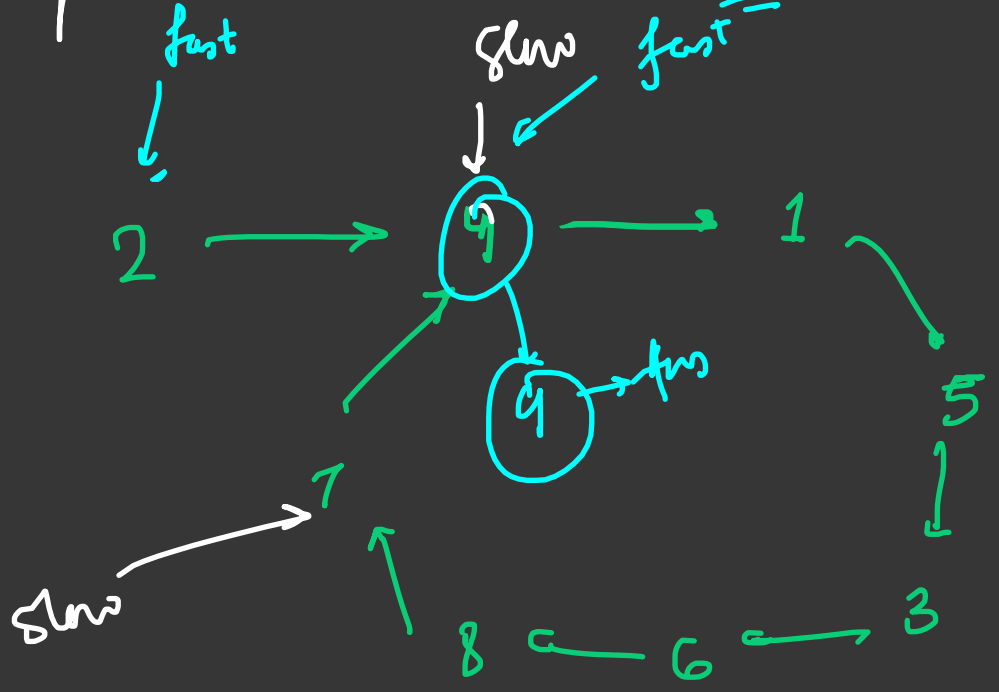
Optimal Approach:

Flyod Algo

arr[] = { 2 5 9 6 9 3 8 9 7 1 }

0 1 2 3 4 5 6 7 8 9





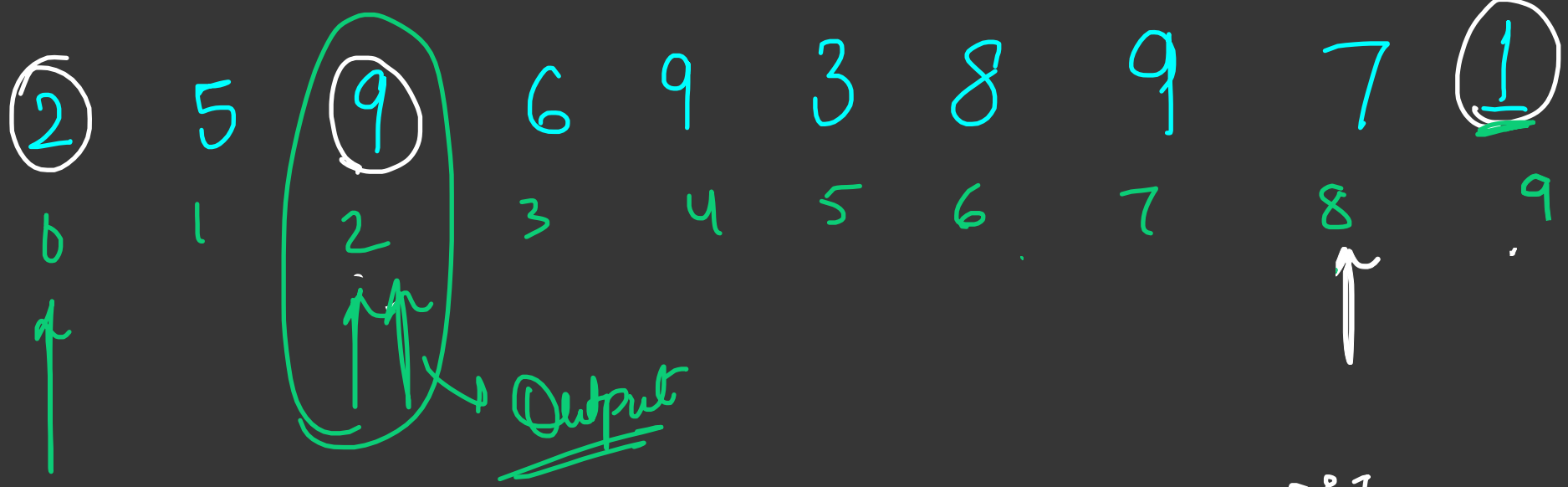
slow += 1

fast += 2

Whenever:

slow == fast

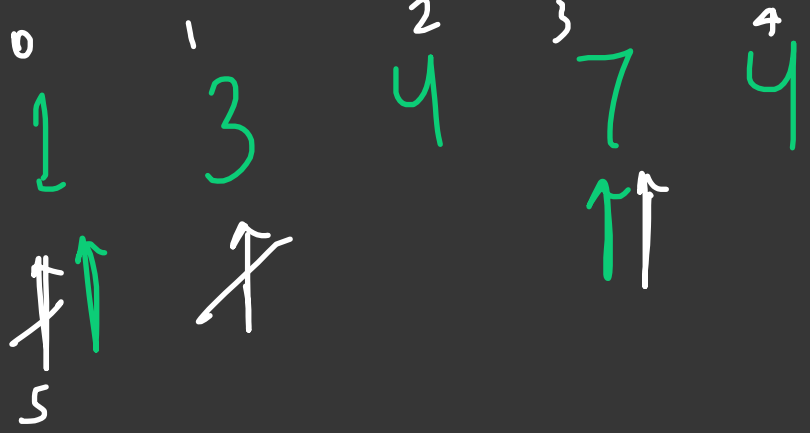
5



arr[0] = 2

slow = arr[i]

fast = arr[arr[i]]



Pseudocode.

```
slow = arr[0];
fast = arr[0];

do {
    slow = arr[slow],
    fast = arr[arr[fast]],
} while( slow != fast);

fast = arr[0];
while (slow != fast)   slow = arr[slow];
                       fast = arr[fast],
```

return slow/fast