

Saturday & Sunday
Re-attempt

9th June Contest (3 questions)

201 more questions

Revision:

Arrays + TC

$pfA[i] =$ Sum of all elements from $[0-i]$

$pf_{even}[i] =$ Sum of all even idx elements from $[0-i]$

$pf_{odd}[i] =$ Sum of all odd idx elements from $[0-i]$

$$\text{sum}(A[2:5]) = 17$$

	0	1	2	3	4	5	6	7
$A = \sum$	3	2	5	7	-1	6	2	5
$pf = \sum$	3	5	10	17	16	22	24	29

	0	1	2	3	4	5	6	7
$A = \sum$	3	2	5	7	-1	6	2	5
$pf_{even} = \sum$	3	3	8	8	7	7	9	9

$[0:1] = 3$
even sum
 $pf_{even}[1]$

	0	1	2	3	4	5	6	7
$A = \sum$	3	2	5	7	-1	6	2	5
$pf_{odd} = \sum$	0	2	2	9	9	15	15	20

$$\text{sum}(A[2:5]) = 13$$

odd index

	0	1	2	3	4
	2	4	3	1	5

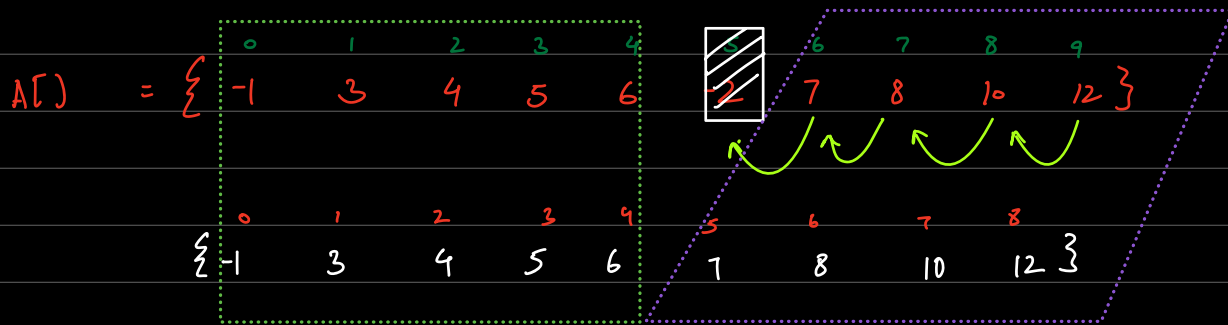
$$pf_{even} = [2 \quad 2 \quad 5 \quad 5 \quad 10]$$

$$\text{sum}(A[l:r])$$

$$\text{sum}(A[l:r]) = \begin{array}{ll} \text{pf}[r] - \text{pf}[l-1] & l > 0 \\ \text{pf}[r] & l = 0 \end{array}$$

$$\begin{array}{ll} \text{sum}(A[l:r]) = & \text{pf}_{\text{odd}}[r] - \text{pf}_{\text{odd}}[l-1] \quad l > 0 \\ \text{odd index sum} & \\ & \text{pf}_{\text{odd}}[r] \quad l = 0 \end{array}$$

$$\begin{array}{ll} \text{sum}(A[l:r]) = & \text{pf}_{\text{even}}[r] - \text{pf}_{\text{even}}[l-1] \quad l > 0 \\ \text{even index sum} & \\ & \text{pf}_{\text{even}}[r] \quad l = 0 \end{array}$$



After the deleted index point
 odd index becomes even
 even index becomes odd

0	1	2	3	4	5
4	1	5	3	7	2

odd index sum

0	1	2	3	4
4	1	3	7	2

Ans: 8

0	1	2	3	4	5	6	7	8	9
2	3	1	5	0	-1	2	-2	10	8

$$3 + 0 + 2 + 10 = 15$$

Special Index

HARD

Google / Meta

Q2) An index is said to be special if after deleting it, Sum of all even index = Sum of all odd index elements.

Count number of special index in the array?

Ans: 2

0 1 2 3 4 5
4 3 2 7 6 -2

Del 0: 0 1 2 3 4
3 2 7 6 -2

even sum: 8

odd sum: 8

Del 1: 0 1 2 3 4
4 2 7 6 -2

even: 9

odd: 8

Del 2: 0 1 2 3 4
4 3 7 6 -2

even: 9

odd: 9

Del 3: 0 1 2 3 4
4 3 2 6 -2

even: 9

sum: 9

Del 4: 0 1 2 3 4
4 3 2 7 -2

even: 4

odd: 10

Del 5: 0 1 2 3 4
4 3 2 7 6

even: 12

odd: 16

Approach 1) for every index create a new array not including
ith index

→ Calculate even sum & odd sum TC: $O(N^2)$

0 1 2 3 4 5 6 7 8 9 10

After deletion

odd sum = { 1 3 6 8 10 }
even sum = { 0 2 4 7 9 }

0 1 2 3 4 5 6 7 8 9
2 3 1 4 0 -1 2 -2 10 8

even: ~~2~~ + ~~4~~ + ~~-1~~ + ~~2~~ + 8 = 8

Del ^{ith}

even index sum : $\text{sum}(A[0:i-1]) + \text{sum}(A[i+1:N-1])$
even index odd index

odd index sum : $\text{sum}(A[0:i-1]) + \text{sum}(A[i+1:N-1])$
odd index even index

$\text{sum}(A[l:r]) = \text{pf}[r] - \text{pf}[l-1] \quad l > 0$
 $\text{pf}[x]$

even index sum : $\text{pf}_{\text{even}}[i-1] + \text{pf}_{\text{odd}}[N-1] - \text{pf}_{\text{odd}}[i+1-1]$

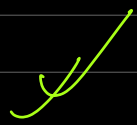
even index sum = $\text{pf}_{\text{even}}[i-1] + \text{pf}_{\text{odd}}[N-1] - \text{pf}_{\text{odd}}[i]$

odd index sum = $\text{pf}_{\text{odd}}[i-1] + \text{pf}_{\text{even}}[N-1] - \text{pf}_{\text{even}}[i]$

1) Calculate pf even pf odd

TC: $O(N)$

SC: $O(N)$



```

count = 0
for (i=0; i < N; i++) {
    if (i == 0) {
        even index sum = pfodd[N-1] - pfodd[i]
        odd index sum = pfeven[N-1] - pfeven[i]
    }
    else {
        even index sum = pfeven[i-1] + pfodd[N-1] - pfodd[i]
        odd index sum = pfodd[i-1] + pfeven[N-1] - pfeven[i]
    }
    if (even index sum == odd index sum)
        count++
}

```

	0	1	2	3	4	5
	4	3	2	7	6	-2
pf even :	Σ 4	4	6	6	12	12 }
pf odd :	Σ 0	3	3	10	10	8 }

$i = 0$

count = 1

even = 8

odd = $12 - 4 = 8$

$i = 1$

even = $4 + 8 - 3 = 9$

count = 1

odd = $0 + 12 - 4 = 8$

$i = 2$

even : $4 + 8 - 3 = 9$

count = 2

odd : $3 + 12 - 6 = 9$

Break (10:30-10:40)

Q3) Given N positive numbers find majority element?

[No extra space]

$N \rightarrow$ more than $\frac{N}{2}$

times

Ex1) 1 2 1 6 1 1

freq(1) = 4

$N = 6$

more than 3 times

Ex2) 3 4 4 8 4 9 4 3 4

Ex3) 3 3 4 6 1 3 2 5 3 3 3

Ans: 3

$N = 11$

more than $\frac{11}{2}$

> 5

6 or more

4 6 5 3 4 5 6 4 4 4

$N = 10$

freq(4) = 5

more than 5 times

No majority at all

6 or more

8



5 or more times

There is either 1 majority or no majority

```

for (i=0; i<N; i++) {
    # count freq of A[i]
    freq =
    if (freq > N/2)
        majority
}

```

TC: $O(N^2)$

Moore's voting algorithm

Delhi 15 seats

✓

BJP

Congress

AAP

Tajdeep

BJP: 1 1 1 1 1 1 1 1 1 1 1

Congress: 1 1

AAP: 1 1

Tajdeep: 1 1 1

winning BJP 9 seats

majority

13 Total more BJP 8

11 6 or more BJP 7

9 5 or more BJP 6

If you remove two distinct elements the majority does not change

0	1	2	3	4	5
1	2	1	6	1	1

Remain : 1

0	1	2	3	4	5	6	7	8
3	4	4	8	4	9	4	3	4

0	1	2	3	4	5	6	7	8	9	10
3	3	4	6	1	3	2	1	3	3	3

0	1	2	3	4	5	6	7	8	9
3	3	4	6	1	3	2	1	3	3

(No)

Candidate : 4

calculate freq of 4

if freq > N/2

4 is ans

else

No majority

- 1) Apply Moore's algo and find candidate
- 2) Find freq of candidate
- 3) freq should be $> N/2$

	0	1	2	3	4	5
Candidate:	1	2	1	6	1	1
Count:	10		10		1	(2)

candidate = 1
freq(1) = 4

2 deleted by skipping
1 " " count--

	0	1	2	3	4	5	6	7	8
cand	3	4	4	8	4	9	4	3	4
count	10		10		1		10		(4) 1

freq(4) = 5

	1	1	1	1	1	2	2	2	2
Card	1	1	1	1	1	1	1	1	
Count	1	2	3	4	5	4	3	2	1

	1	1	2	2
Card	1	1	1	1
Count	1	2	1	0

TODO: Try the code

Done!

Q)

[3 7 5 9 11 12 13 2 4]

Min swaps to get all elements $\leq B$ together

$B=6 \rightarrow \{ 3 2 4 5 \}$

[3 7 5 9 11 12 13 2 4]

$\{ 3 2 4 5 \}$

$\{ 3 2 4 5 \}$

$\{ 3 2 4 5 \}$

$\{ 3 2 4 5 \}$

$\{ 3 2 4 5 \}$

$\{ 3 2 4 5 \}$

3 2 4 5

[3 7 5 9 11 12 13 2 4]
 2

Ans: 2

[3 7 5 9 11 12 13 2 4]
 3

[3 7 5 9 11 12 13 2 4]
 3

[3 7 5 9 11 12 13 2 4]
 4

[3 7 5 9 11 12 13 2 4]
 3

[3 7 5 9 11 12 13 2 4]
 2

1) Find window size
 → iterate and count numbers $\leq B$

2) for first window find no. of elements $> B$
 x

for every window
 if incoming elem $> B$
 count++
 if outgoing elem $> B$
 count--