

Friday 9:00PM → Advanced DSA Contest 2 Live
8th December



Recursion, Maths, OOPS

Method Overloading
Overriding

Rettempt 1 : 9th Dec 12:01AM to
10th 11:59 PM

Rettempt 2 : 16th Dec 12:01AM to
24th Dec 11:59 PM

Q. Given an integer array of size N & an integer K .

Check if there exists a pair (i, j) s.t.

1) $A[i] + A[j] == K$

2) $i \neq j$

Eg: $A = [8, 9, 1, -2, 4, 5, 11, -6, 4]$

$K = 6 \Rightarrow (0, 3) \neq (2, 5) \Rightarrow \text{True.}$

$K = 22 \Rightarrow \text{false}$

$$K = 8 \Rightarrow (4, 8) \Rightarrow \text{True.}$$

! $[\overset{0}{\underline{3}}, \overset{1}{5}, \overset{2}{1}, \overset{3}{2}, \overset{4}{1}, \overset{5}{2}]$

$$7 - 3 = \textcircled{4}$$

$$\underline{K = 7} \Rightarrow \text{True.}$$

Solⁿ > Brute Force

\Rightarrow Check for all pairs.

for $(i = 0 \text{ to } N-1) \{$

for $(j = 0 \text{ to } N-1) \{$

if $(i \neq j) \{$

if $(A[i] + A[j] == K) \{$
return True;

}

}

}

}

return false;

$$T.C. = O(N^2)$$

$$N = 5$$

	$j=0$	$j=1$	$j=2$	$j=3$	$j=4$
$i=0$	(0,0)	(0,1)	(0,2)	(0,3)	(0,4)
$i=1$	(1,0)	(1,1)	(1,2)	(1,3)	(1,4)
$i=2$	(2,0)	(2,1)	(2,2)	(2,3)	(2,4)
$i=3$	(3,0)	(3,1)	(3,2)	(3,3)	(3,4)
$i=4$	(4,0)	(4,1)	(4,2)	(4,3)	(4,4)

```

for  $(i=0 \text{ to } N-1)$  <
    for  $(j=i+1 \text{ to } N-1)$  <

```

```

        if  $(A[i] + A[j] == K)$  <
            return True;
    <

```

```

    <
return false;

```

$T.C. = O(N^2)$

(i, j) s.t. $A[i] + A[j] = K$

<u>i</u>	$A[i]$	j	$(K - A[i])$
0		$[1, N-1]$	
1		$[2, N-1]$	
2		$[3, N-1]$	
\vdots			
$N-2$		$[N-1, N-1]$	
$N-1$		X	

2) Optimised (~~Using HashSet~~)

Wrong
solⁿ

⇒ We can insert all the elements in the HashSet

⇒ $\forall i \Rightarrow$ Check if $(K - A[i])$ exists in the HashSet or not.

	x	x	i						
	0	1	2	3	4	5	6	7	8
$K = 4$									
$A[i] =$	8	9	<u>2</u>	-2	4	5	11	-6	4
	X	X	✓						
<u>$K - A[i]$</u>	-4	-5	2						
				True					

True X

8, 9, 2, -2
4, 5, 11
-6

$A[i] == K - A[i]$

Target

Check if atleast 2 elements with value $A[i]$ are present in the array.

2) Optimised (Using HashSet)

<u>i</u>	A[i]	j	(K - A[i])
0		[1, N-1]	
1		[2, N-1]	
2		[3, N-1]	
⋮			
N-2		[N-1, N-1]	
N-1		X	

K = 9

A = { 8, 9, 2, -2, 4, 5, 11, -6, 4 }

target
(K - A[i])

i	j	i	i
5	6	7	8
5	11	-6	4
4	-2	15	5
✓	X	X	X

True

4, -6, 11

HashSet

Code

```
HashSet <int> hs;
```

```
for (i = N-1; i >= 0; i--) {  
    target = K - A[i];
```

```
    if (hs.containsKey(target)) {  
        return true;
```

```
    }  
    hs.insert(A[i]);
```

```
}  
return false;
```

T.C. = $O(N)$

S.C. = $O(N)$

Q

0 1 2 3 4 5
[3, 5, 1, 2, 1, 2]

K = 3

Count of pairs

(2, 3)

(2, 5)

(3, 4)

(4, 5)

Q Given an integer array of size N & an integer K

And count of pairs (i, j) s.t. $(i \neq j)$
& $(A[i] + A[j] == K)$

$K = 10$

$A = [2, 5, 2, 5, 8, 5, 2, 8]$

$i \quad j \quad i \quad j \quad i \quad j \quad i \quad j$

$0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$

$2 \quad 5 \quad 2 \quad 5 \quad 8 \quad 5 \quad 2 \quad 8$

$8 \quad 5 \quad 2 \quad 5 \quad 8 \quad 2$

Target
Count

$+1 \quad +1 \quad +1 \quad +0 \quad +1 \quad +0$

??

8, 2, 5,

~~HashSet~~

||

HashMap

$K=10$ i ~~i~~ ~~i~~ ~~i~~ ~~i~~ ~~i~~ ~~i~~ ~~i~~ ~~i~~

Target $A = \begin{bmatrix} 2, 5, 2, 5, 8, 5, 2, 8 \\ 8, 5, 8, 5, 2, 5, 8, 2 \end{bmatrix}$

ans=0 +2 +2 +2 +1 +1 +0 +1 +0

(Element)
Key

(Freq)
Value

Ans=9

8

~~1~~ 2

2

~~1~~ ~~2~~ 3

5

~~1~~ ~~2~~ 3

Q Given an array of size N . &
an integer K
Check if a subarray with sum= K
exists or not.

$A = \begin{bmatrix} 2, 3, 9, -4, 1, 5, 6, 2, 5 \end{bmatrix}$

$K=11 \Rightarrow [2, 3, 9, -4, 1] \text{ or } [5, 6] \text{ True}$

$K=10 \Rightarrow [2, 3, 9, -4] \Rightarrow \text{True}$

Quiz

$K = 110$
 $A = [5, 10, 20, 100, 105]$

NO

Solⁿ 1) Brute force

⇒ Check for each subarray if $(\text{sum} == K)$

```
for (i = 0 to N-1) {  
    for (j = i to N-1) {
```

```
        sum = 0;
```

```
        for (k = i to j) {
```

```
            sum = sum + A[k];
```

```
        }
```

```
        if (sum == K) {
```

```
            return True;
```

```
        }
```

```
    }
```

```
}
```

```
return false;
```

T.C. = $O(N^3)$

S.C. = $O(1)$

for ($i = 0$ to $N-1$) &

$sum = 0;$

 for ($j = i$ to $N-1$) &

$sum = sum + A[j];$

 if ($sum == K$) &

 return True;

 &

&

&

return false;

T.C. = $O(N^2)$

S.C. = $O(1)$

Optimise ?? \Rightarrow Prefix Sum

If there exists a pair (s, e) s.t.

$Sum[s, e] = K$

\Downarrow

$Pre[e] - Pre[s-1] = K$

Subarray $\Rightarrow (s \leq e)$

$s = 1 \Rightarrow e = [1, N-1]$

$(s-1 = 0) < [1, N-1]$

$\{ \text{if } (s == 0) \text{ \& } Pre[e] = K \}$

$$A[9] = \{ \overset{0}{2}, \overset{1}{3}, \overset{2}{9}, \overset{3}{-4}, \overset{4}{1}, \overset{5}{5}, \overset{6}{6}, \overset{7}{2}, \overset{8}{5} \}$$

$$Pre[N] = \{ 2, 5, 14, 10, 11, 16, 22, 24, 29 \}$$

1) If diff of any pair (i, j) ,

$$(Pre[j] - Pre[i] == K)$$

$$\& \quad i < j$$

2) $(Pre[j] == K)$ for any

$$(0 \leq j \leq N-1)$$

↓
Using one for loop.

Q Given an integer array of size N. & an integer K

Check if there exists a pair (i, j) s.t.

1) $i < j$

2) $A[j] - \underline{A[i]} == K$

ans: 1) Yes, 2) Yes

$$A[i] = K + A[i] \Rightarrow \text{change}$$

$$A = \begin{bmatrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 9 & -4 & 1 & 5 & 6 & 2 & 5 \end{bmatrix}$$

Target

HashSet <int> hs;

for (i = N-1; i > 0; i--) {
 target = K + A[i];

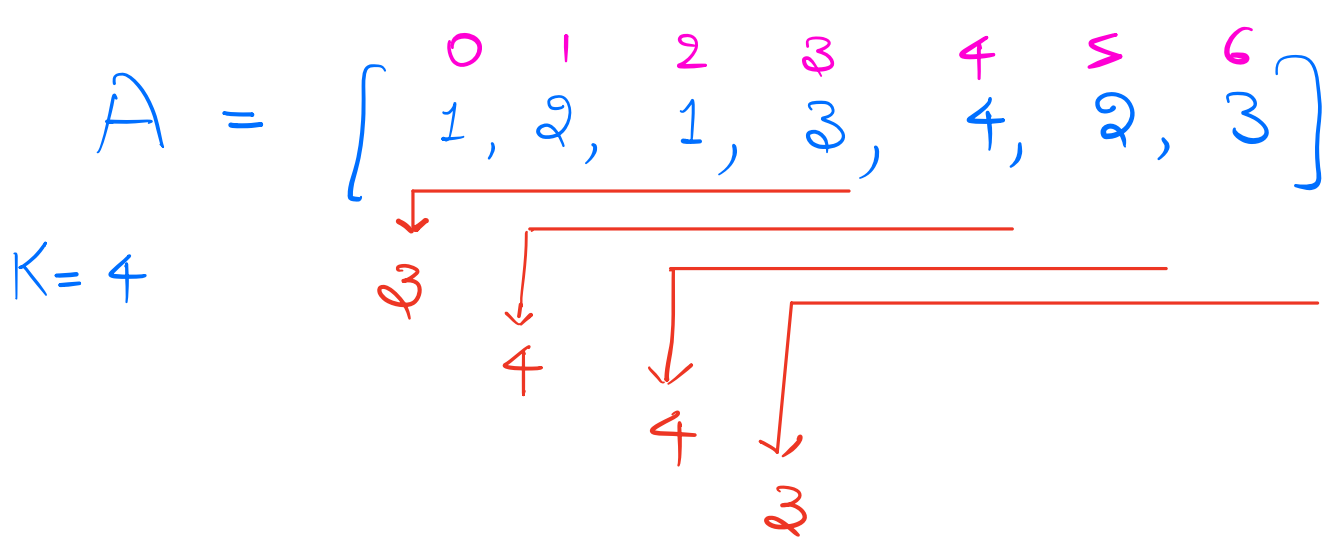
 if (hs.containsKey(target)) {
 return true;

 }
 hs.insert(A[i]);

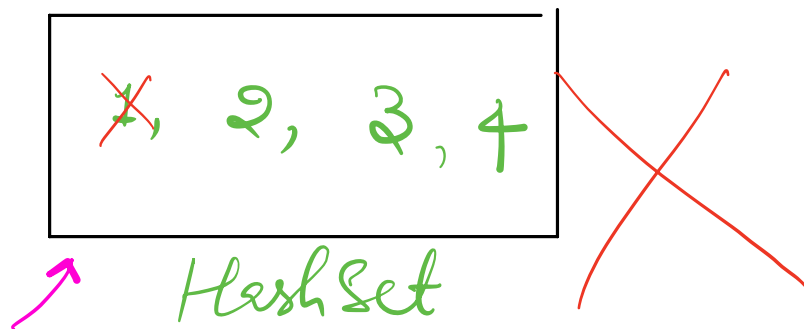
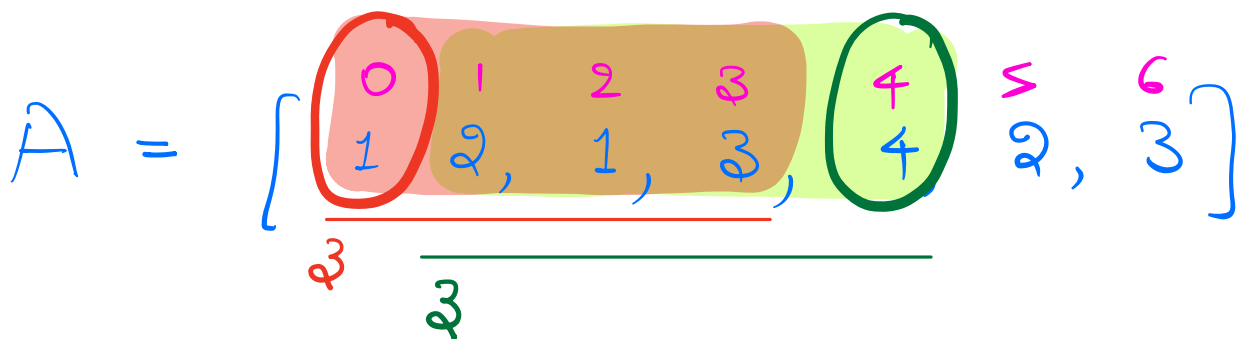
}
 return false;

Q Given an integer array of size N
 & an integer K.

Find the count of distinct elements in
 every sliding window of size K.



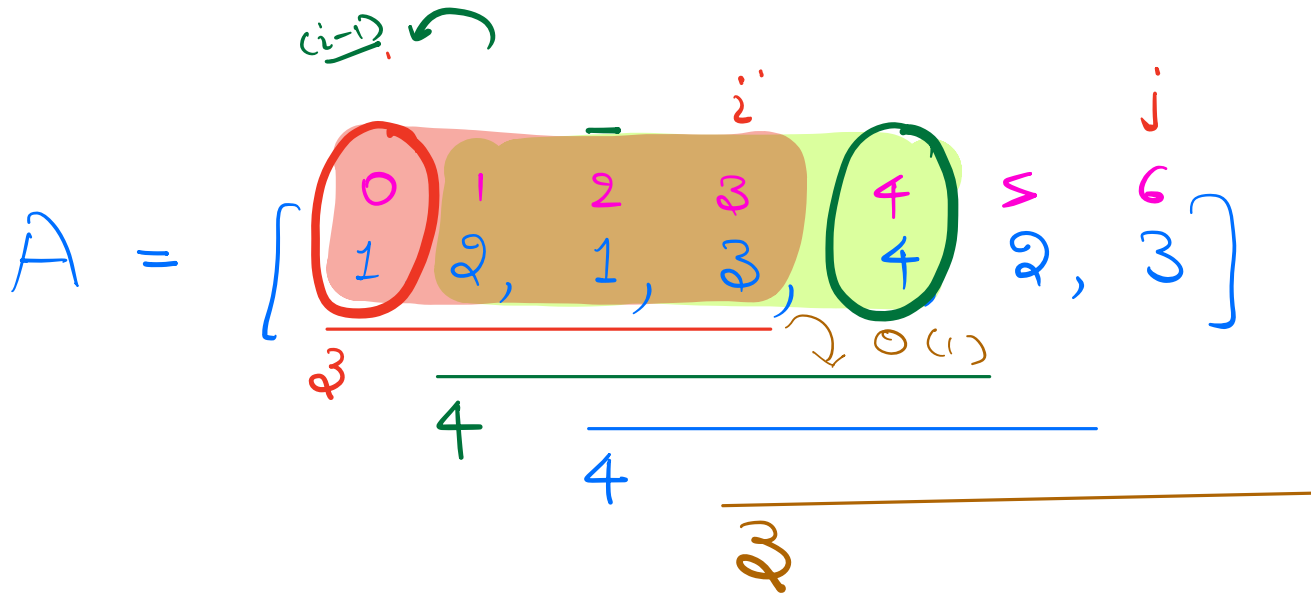
Solⁿ 1) HashSet ??



\Rightarrow We need to create a freq map for every window

& update the count everytime the window moves.

⇒ If the count of any element becomes 0, then remove the element.



Key	Value
1	1
2	2
3	1
4	1
	2
	1
	0