BF

$i : 0 \rightarrow n-1$
  sum = 0
  $j : i \rightarrow n-1$
    sum += arr[j]

TC = $O(n^2)$
AS = $O(1)$

[4, 2, -3, 1, 6]

g = ~~4~~ ~~2~~ -3

l = ~~4~~ ~~2~~ -3

0 1 2 3 4

arr: [4, 2, -3, 1, 6]

pref: [4, 6, 3, 4, 10]

a_0 ... $a_0 + a_1 + a_2 + a_3$

$\cancel{a_0} = \cancel{a_0} + \underbrace{a_1 + a_2 + a_3} = 0$

TC: $O(n)$
AS: $O(n)$

[1, 2, -3, 10, 11]

```
bool checkZeroSumSubarray(vector<int> arr) {

    int n = arr.size();

    unordered_set<int> sums;
    int sum = 0;

    for (int i = 0; i < n; i++) {
        sum += arr[i];
        if (sums.find(sum) != sums.end()) { // If the sum has been seen before.
            return true;
        }
        sums.insert(sum);
    }

    return false;
}
```

0

arr: [1, 2, -3, 10, 11]

pref: [1, 3, 0, 10, 21]

arr: [1, 2, 4, 6, 10, -7]   x = 20

pref: [1, 3, 7, 13, 23, 16]

[1, 3, 7,
13
]

---

0 1 2 3 4 5 6

[1, 0, 0, 1, 0, 1, 1]

(0, 1) (0, 3) (0, 5)
(1, 6)
(2, 3) (2, 5)
(3, 4)
(4, 5)

O/P = 8

BF

$i : 0 \rightarrow n-1$
  zeros = 0
  ones = 0   diff = 0
  $j : i \rightarrow n-1$
    if arr(j) == 0 : zeros ++   diff --
    else ones ++   diff ++
    if (zeros == ones)   diff == 0
      res ++   res ++

TC = $O(n^2)$
AS = $O(1)$

	0	1	2	3	4	5	6
arr:	1	0	0	1	0	1	1
ones	1	1	1	2	2	3	4
zeros	0	1	2	2	3	3	3
diff	1	0	-1	0	-1	0	1

		0	1	2	3	4	5	6
arr:		1	-1	-1	1	-1	1	1
pref:	0	1	0	-1	0	-1	0	1
		0	1	0	2	1	3	1

O/P = 1 + 2 + 1 + 3 + 1 = 8

-1 -1 -1

[1 0 0 1 0 1 1]

pref: [1 0 -1 0 -1 0 1]

sum   freq
0 → ~~1~~ ~~2~~ ~~3~~ 4
1 → ~~1~~ 2
-1 → ~~1~~ 2

res = ~~0~~ ~~1~~ ~~3~~ ~~4~~ ~~7~~ 8

TC: $O(n)$
AS: $O(n)$

---

0 1 2 3 4 5 6 7 8 9 10 11 12

geeks for geeks

O/P = 7

~~geksefor~~

~~g~~ ~~e~~ ~~k~~ ~~s~~
e f o r
④

BF

$i : 0 \rightarrow n-1$
  ⇒ freq ( )
  $j : i \rightarrow n-1$
    inc freq.

TC = $O(n^2)$
AS = $O(1)$

0 1 2 3 4 5 6 7 8 9 10 11 12

geeks for geeks

char → bool
g → ~~T~~ ~~F~~ ~~T~~ F
e → T
K → ~~T~~ ~~F~~ T
S → ~~T~~ ~~F~~ T
f → ~~T~~ F
o → ~~T~~ F
r → ~~T~~ F

TC = $O(n)$
AS = $O(26) = O(1)$

res = ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7

~~heto~~ 0 1 2 3 4 5 6 7 8 9 10 11 12

geeksfor geeks

9 - 3 + 1 = 7