Majority Element

0 1 2 3 4 5 6

nums = [2, 2, 1, 1, 1, 2, 2]

Output = 2

n = 7

Majority Element

frequency > n/2

2 : 4 > 7/2 (3)

Approach 1 : Sort the array — nlogn

↳ Θ(nlogn) (1, 1, 1, 2, 2, 2, 2)

↳ (2)

Approach 2 : Hash Data Structure (Dictionary)

(key, value)

2 : 4 *

1 : 3

Output = 2

TC = O(n)

SC = O(n)

Hashtable

key	value
2	4
1	3

(2)

Approach 3: Boyer-Moore Voting Algorithm

{ TC → O(n)
{ SC → O(1)

$2 \leftrightarrow 4 > 7/2\ (3)$

↳ Yes

Example 1

[2, 2, 1, 1, 1, 2, 2]

candidate = ~~None~~ ~~1~~ 2

count = ~~0~~ ~~1~~ ~~2~~ ~~1~~ ~~0~~ ~~1~~ ~~2~~ ~~1~~ ~~0~~ 1

num == candidate
↳ count += 1

count == 0
↳ candidate = num

else:
count -= 1

Example 2

n = 5

n/2 = 5/2 = 2

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

Output = $3 \leftrightarrow 3 > 2\ (n/2)$

candidate = ~~None~~ ~~2~~ ~~3~~ 4 3

count = ~~0~~ ~~1~~ ~~0~~ ~~1~~ ~~0~~ ~~1~~ 2 ~~0~~ ~~1~~

$3 \leftrightarrow 3 > n/2$

↳ Yes

Example 3

0 1 2 3 4

(2, 3, 7, 3, 4)

$n = 5$

$n/2 = 5/2 = 2$

$3 \leftrightarrow 2 \not> n/2$

↳ No majority element

~~2~~ ~~3~~ ↑ 3 4

candidate = ~~None~~

count = ~~0~~ ~~1~~ ~~0~~ ~~1~~

~~0~~ ~~1~~ ~~0~~

1 ~~0~~ ~~1~~

$4 \leftrightarrow 1 \not> n/2$

↳

No majority element