Barış Ayyıldız

1901042252

**Part 1 :**

II. Add/remove product.

**Add Products**

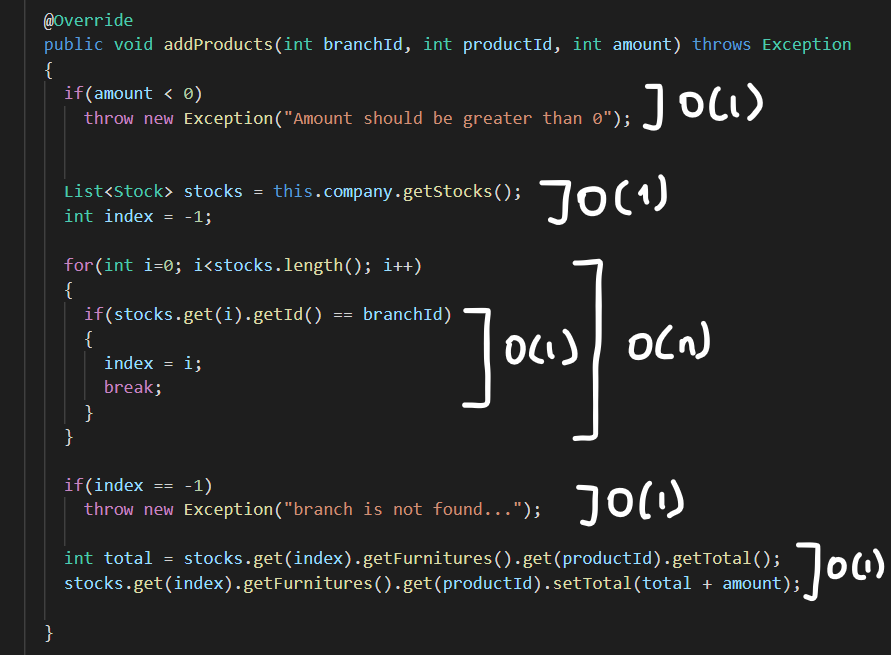
O(1)+ O(1)+ O(n)+ O(1) = **O(n)**

Since there is a breaking condition, the worst case is linear

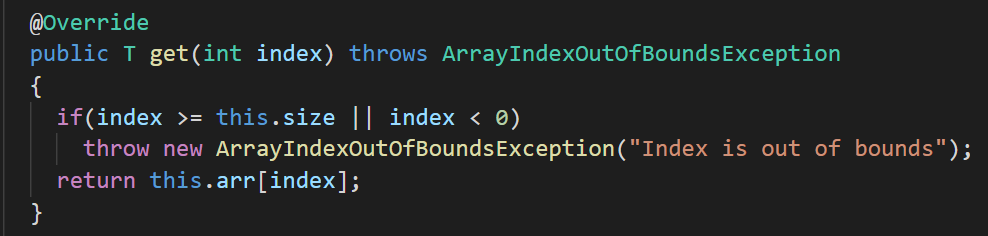
Tworst = **O(n)**

Tbest = **Ω(1)**, best case is constant time, when the algorithm iterates once inside for loop

n is equal to length of stock array in this case



All getters and setters take constant time, Θ(1)



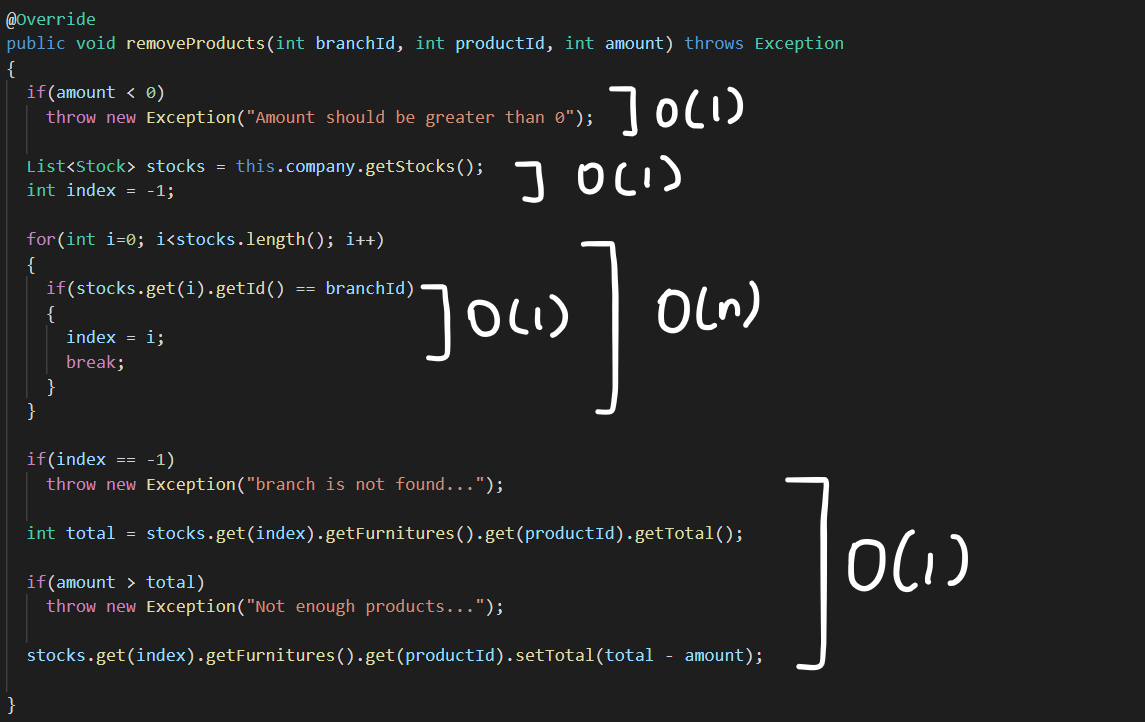
**Remove Products**

Since there is a breaking condition, the worst case is linear

Tworst = **O(n)**

Tbest = **Ω(1)**, best case is constant time, when the algorithm iterates once inside for loop

n is equal to length of stock array in this case

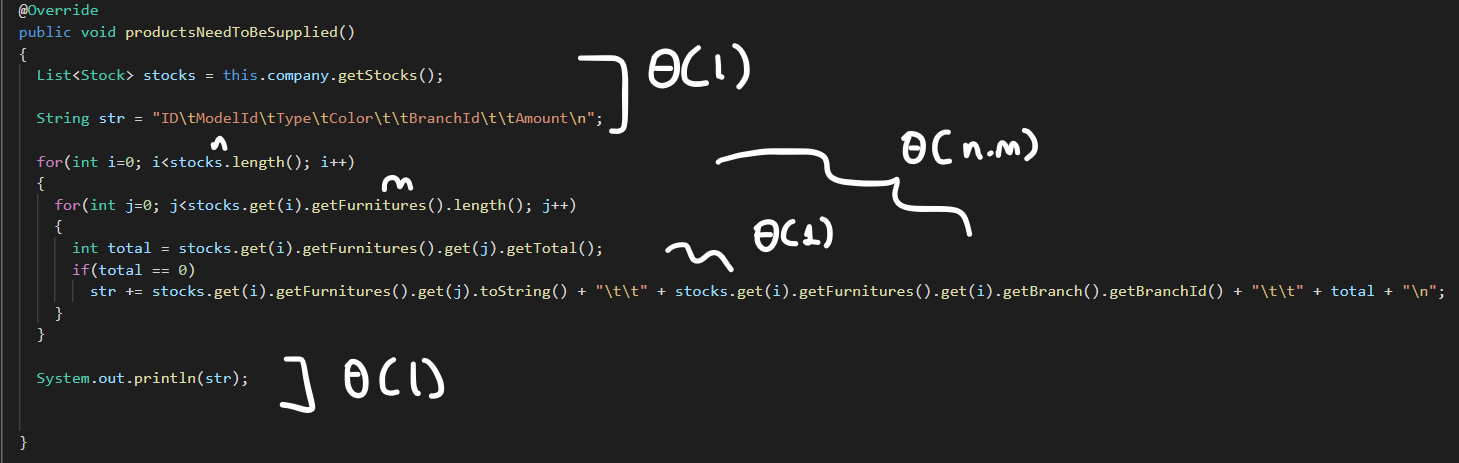


III. Querying the products that need to be supplied.

n is length of stocks, m is length of furnitures array

Since there is no breaking condition inside nested for loop

Θ(1) + Θ(n\*m)+ Θ(1) = Θ(n\*m)



All getters and setters take constant time, Θ(1)

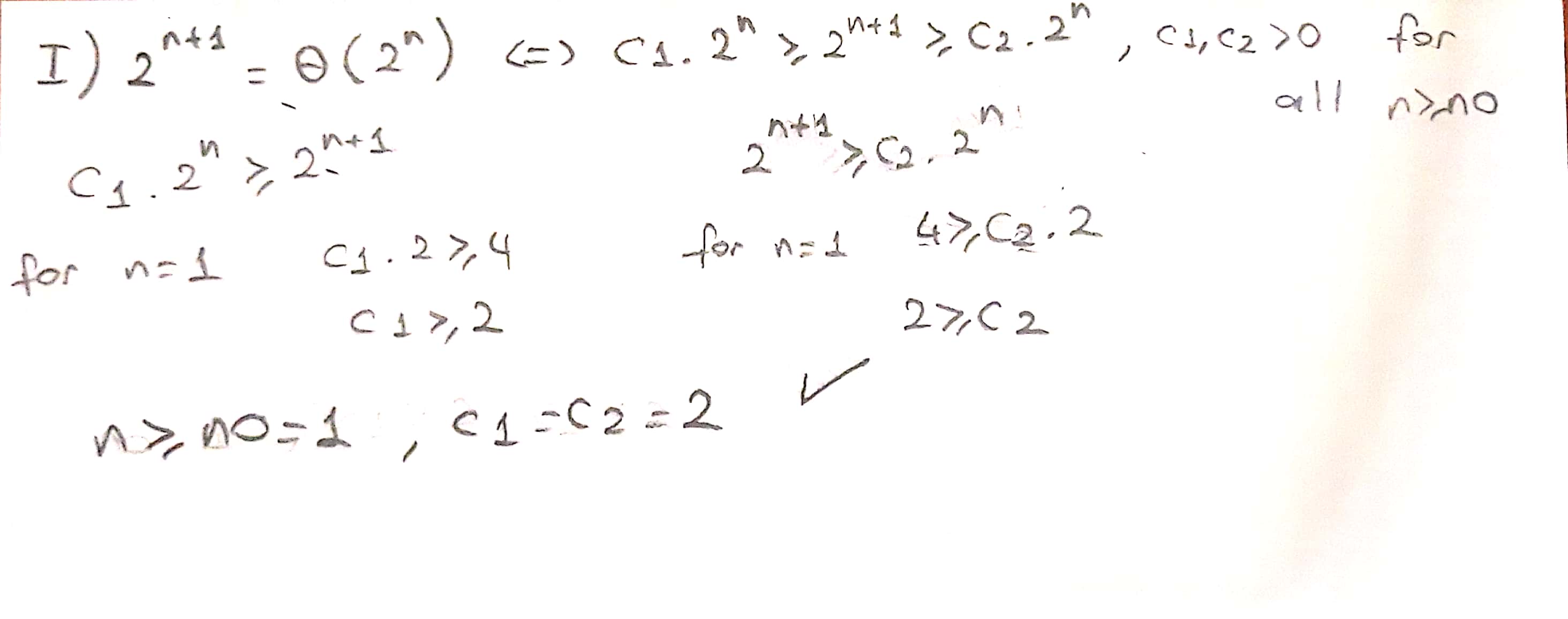


**Part 2 :**

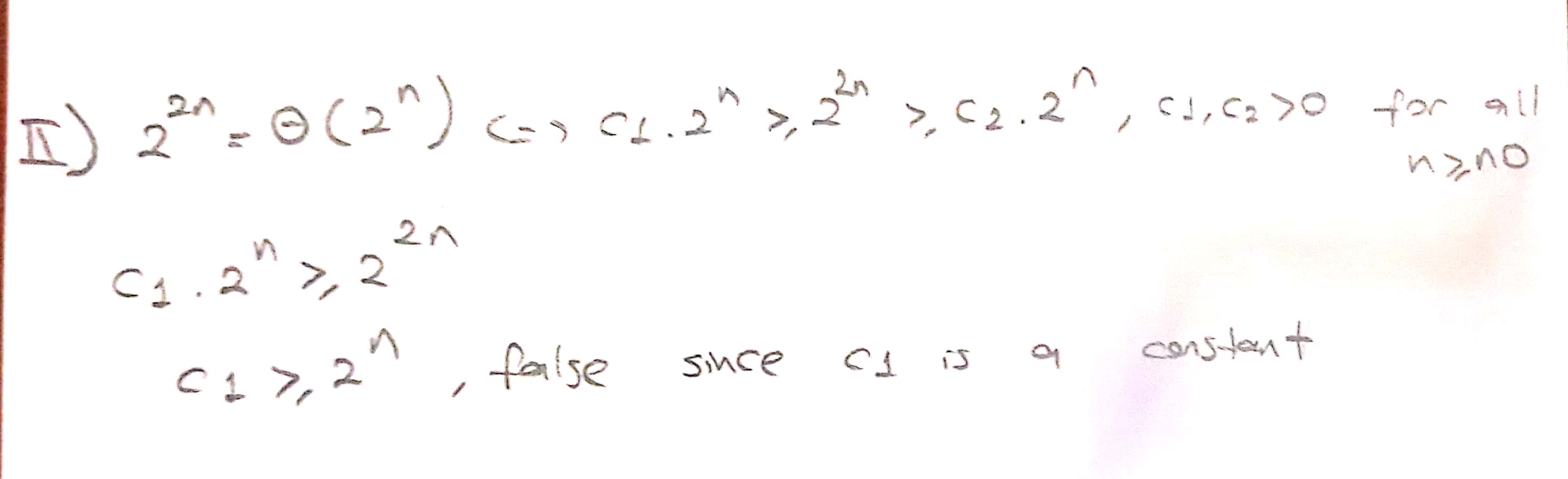
1. Explain why it is meaningless to say: “The running time of algorithm A is at least O(n2 )”.

Because by definition, Big O notation refers to the worst case of an algorithm.

1. Let f(n) and g(n) be non-decreasing and non-negative functions. Prove or disprove that: max(f (n), g(n)) = Θ(f(n) + g(n)).
2. Are the following true? Prove your answer.
3. 2n+1= Θ(2n)



1. 22n= Θ(2n)



1. Let f(n)=O(n2 ) and g(n)= Θ(n2 ). Prove or disprove that: f(n) \* g(n) = Θ(n4 ).

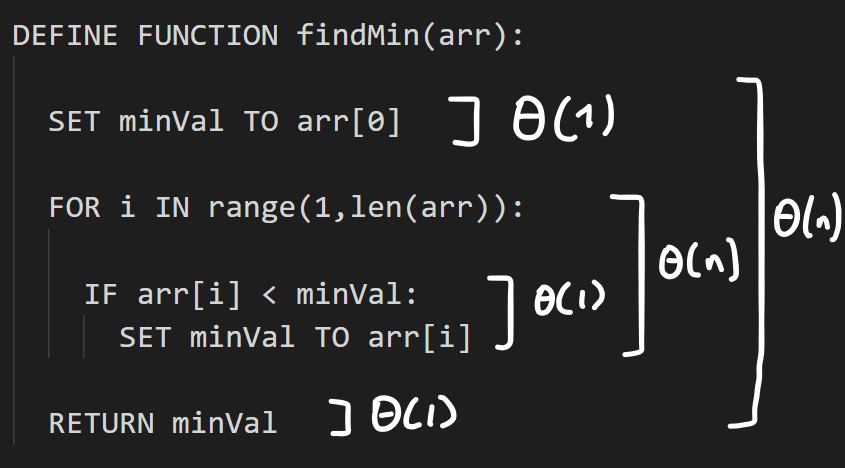
**Part 3 :**

List the following functions according to their order of growth by explaining your assertions.

n 1.01, nlog2n, 2n , √n, (log n)3 , n2n , 3n , 2n+1, 5 log2 n , logn

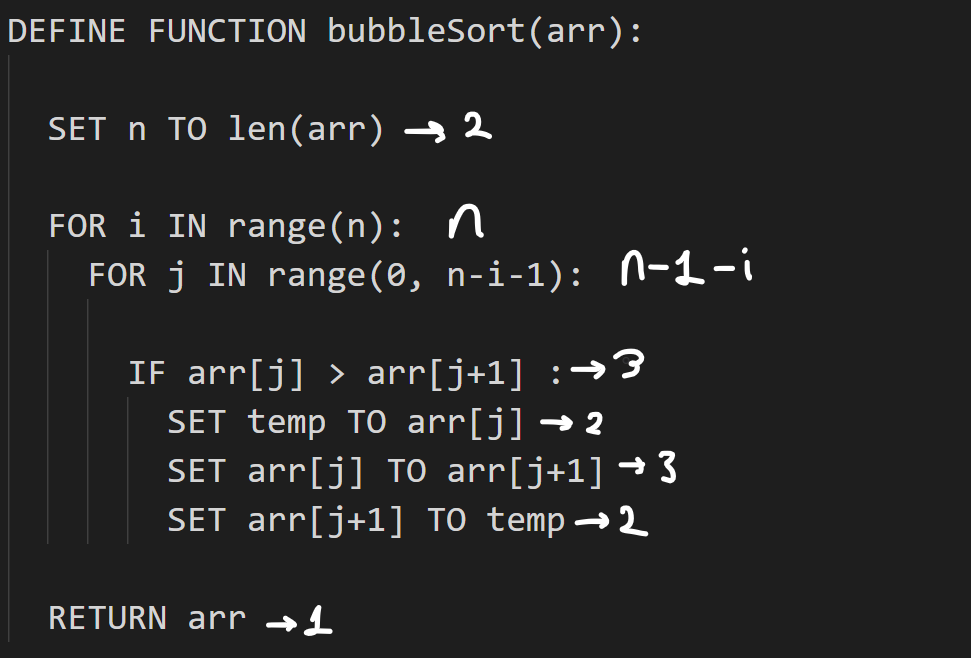
**Part 4 :**

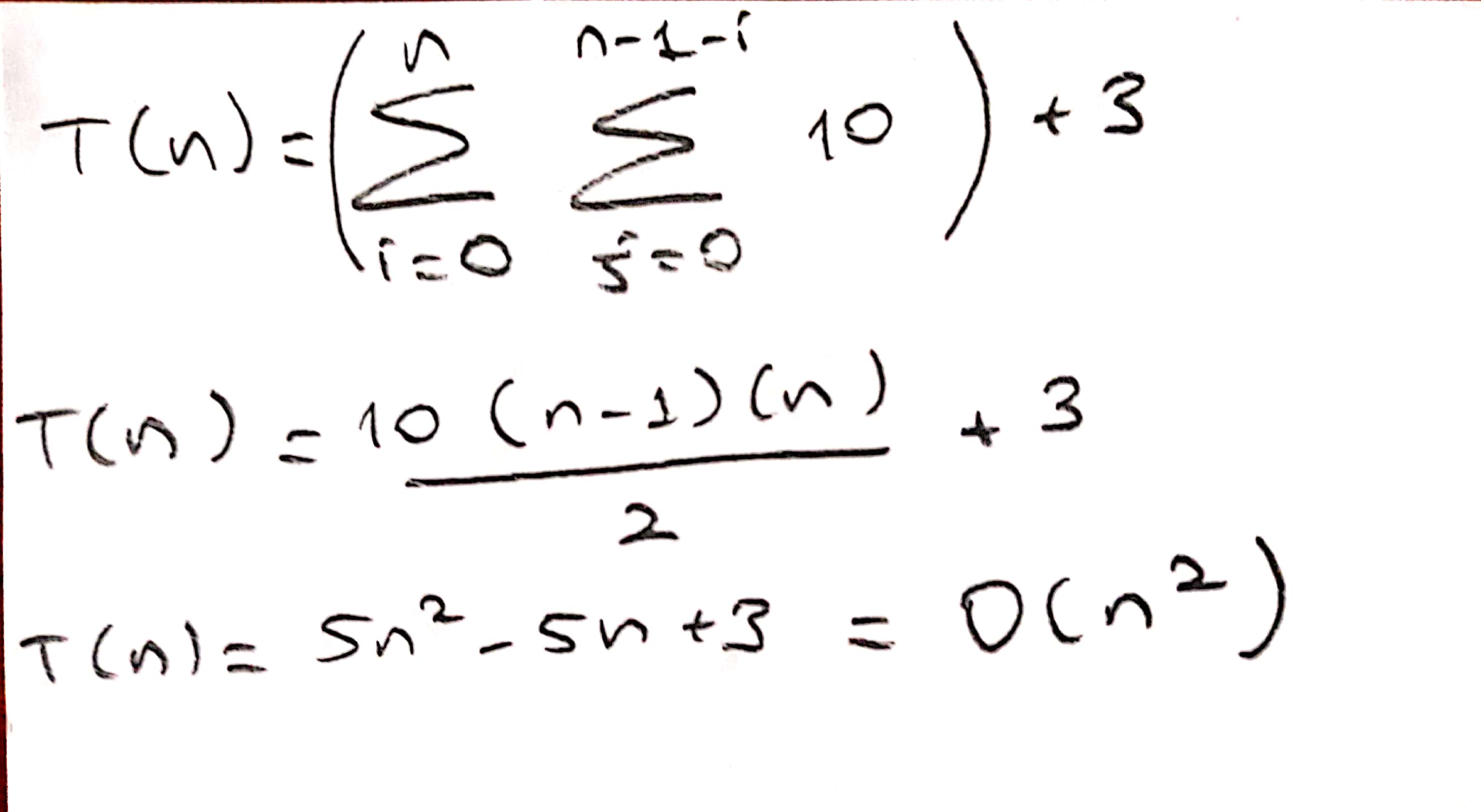
- Find the minimum-valued item.



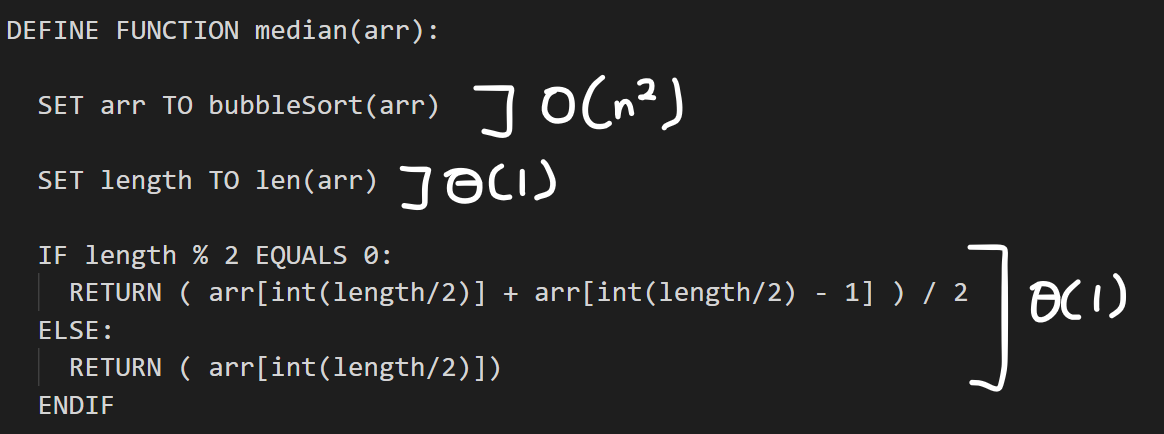
- Find the median item. Consider each element one by one and check whether it is the median.

Bubble sort





Bubble sort’s time complexity is **O(n2)**



O(n2)+ Θ(1)+ Θ(1)

In worst case : Tworst = **O(n2)**

- Find two elements whose sum is equal to a given value

- Assume there are two ordered array list of n elements. Merge these two lists to get a single list in increasing order.

**Part 5 :**