

ICCS200: Assignment 1

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Exercise 1:

We know we have n bottles of wines and one of them is poisonous. We also know we have only $\log_2 n$ testers to test the wine with this restrane we can use the binary system to weed out which bottle is poisonous. We can say 0 is assign to not drink and 1 is assign to drink the amount of binary bit use is $\lceil \log_2(n+1) \rceil$ to see the amount of people to use to solves the problem.

Bottle \ Tester	First person	Second person
1	0	0
2	0	1
3	1	1

Exercise 2:

(1)

swap = $O(1)$, helperMethod1 = $O(n)$

method1 = $O(1) + (\text{swap} + \text{helperMethod1}) O(n)$

method1 = $O(n^2) \Rightarrow \Theta(n^2)$

This is for both best-case & worst-case.

(2)

method2 = $O(n) + O(n)(O(1)) \Rightarrow O(n) \Rightarrow \Theta(n)$

(3)

Method3 = $O(1) + O(1) + O(1)(O(n)(O(\log n))) + O(1)$

= $O(n * \log n) \Rightarrow \Theta(n \log n)$

Exercise 3:

We know length of ys is $\frac{n}{2}$ and loop cost $O(n)$ also in the making of ys . We put ys to recursion so its $T(\frac{n}{2})$

$$\text{halvingSum} = O(n) + O(n) + T(\frac{n}{2}) \Rightarrow O(n)$$

We recursion takes $T(n-1)$ because it take range 1 to length its takes $O(1)$ because it returns and $O(n)$ is the amount it took for copyOfRange

$$\text{anotherSum} = (O(1) + T(n-1)) + O(n) \Rightarrow O(n)$$

copyOfRange takes $O(n)$ splitting the list to do recursion take $T(\frac{n}{2})$ and the reset of the code take combinely $O(n)$

$$\text{prefixSum} = O(n) + T(\frac{n}{2}) + O(n) + T(\frac{n}{2}) + O(n) \Rightarrow O(\log n)$$