Ordering Report: Order VS Disorder

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Nahom is my friend. He is originally from Ethiopia but he lived in Florida and Maryland half of his life now.

#1: Nahom's Dishwashing Algorithm

Nahom sorts his dishes before he washes them by dirtiness. He said this helps prioritize tasks and saves time. (Running the dishwasher and manually washing in parallel saves time.)

Let's look at his algorithm and steps:

Algorithm complexity and steps:

1. Sort all the dirty dishes into two groups:

   Very dirty and sticky dishes → Place in the dishwasher.

   Almost clean dishes → Set aside for manual washing.

   - ***Requires examining each dish once → O(n).***
2. Run the dishwasher for the very dirty dishes.
   - ***This is machine's work so O(1)***
3. While the dishwasher runs, begin washing the "almost clean" dishes by hand.
   - ***Washing is typically O(n) if each dish is handled once.***
4. Once the dishwasher finishes, remove the dishes and inspect them:

   If any dishes aren't fully clean, wash them by hand. Otherwise, move them to the drying rack.

   - ***In the worst case, all dishwasher-cleaned dishes might need to be rewashed by hand. This adds O(n) in the worst-case scenario.***
5. Sort all washed dishes into their appropriate storage spots (e.g., plates, cups, utensils).
   - ***This is O(n) since there are no complicated comparisons here.***

Big O Notation= O(n)

What does n represent? **n:** The total number of dishes to be cleaned.

Mostly the steps (hand-washing and sorting) is either O(n) or constant time for non-repetitive tasks.

However, **sorting dishes in Step 1** had the potential to increase to O(n^2) **IF** he compared dishes but Nahom just uses his common sense to sort them as dirty or not.

Also NOTE:, parallelizing tasks (washing and running the dishwasher simultaneously) is a good strategy for time efficiency.

Improvements could be used:

Instead of sorting by dirtiness manually, I suggested Nahom could load all dishes directly into the dishwasher for the first cycle. Only the dishes that need further cleaning would then be hand-washed.

This reduces the sorting step and could simplify the process, especially for large loads of dishes and increases efficiency.

#2: Cleaning and Restacking Books Algorithm

Nahom follows a methodical process when cleaning and organizing his bookshelf. He first removes all the books, cleans the shelf, and then sorts the books by height before restacking them. He said this ensures the shelf is thoroughly cleaned and the books are neatly arranged, making it visually appealing and easier to find specific books later.

Let's look at his algorithm and steps:

Algorithm Complexity and Steps:

1. Remove all the books from the shelf and place them on the floor.
    - ***Requires handling each book once → O(n).***
2. Clean the shelf with a cloth or duster.
    - ***Constant time task → O(1).***
3. Sort the books by size (shortest to tallest).
    - ***Compare two books at a time. Swap their positions if the shorter book is after the taller one. Repeat until all books are sorted.***
    - ***This sorting is what we learned in class very well and is done using Bubble Sort, which requires O(n^2) comparisons in the worst case.***
4. Restack the sorted books on the shelf.
    - ***Requires handling each book once → O(n).***

5. Wipe down the book covers as they are restacked.
    - ***Each book is wiped once → O(n).***

Big O Notation: O(n^2)

What does n represent? **n:** The total number of books to clean and restack.

While most steps (removing books, cleaning, restacking, and wiping) are **O(n)**, the sorting step (Bubble Sort) dominates the complexity and makes the overall process O(n^2)

He does it like this because sorting the books by height makes the shelf look organized and aesthetically pleasing– a reasonable algorithm.

Improvements Nahom could use:

Nahom could break the problem down into smaller chunks especially when the number of books increases. He could use what is known as merge sort and have a more efficient sorting algorithm. He would then have a complexity of **O(n log n)** instead of **O(n^2)**.