

Introduction to CSE-203

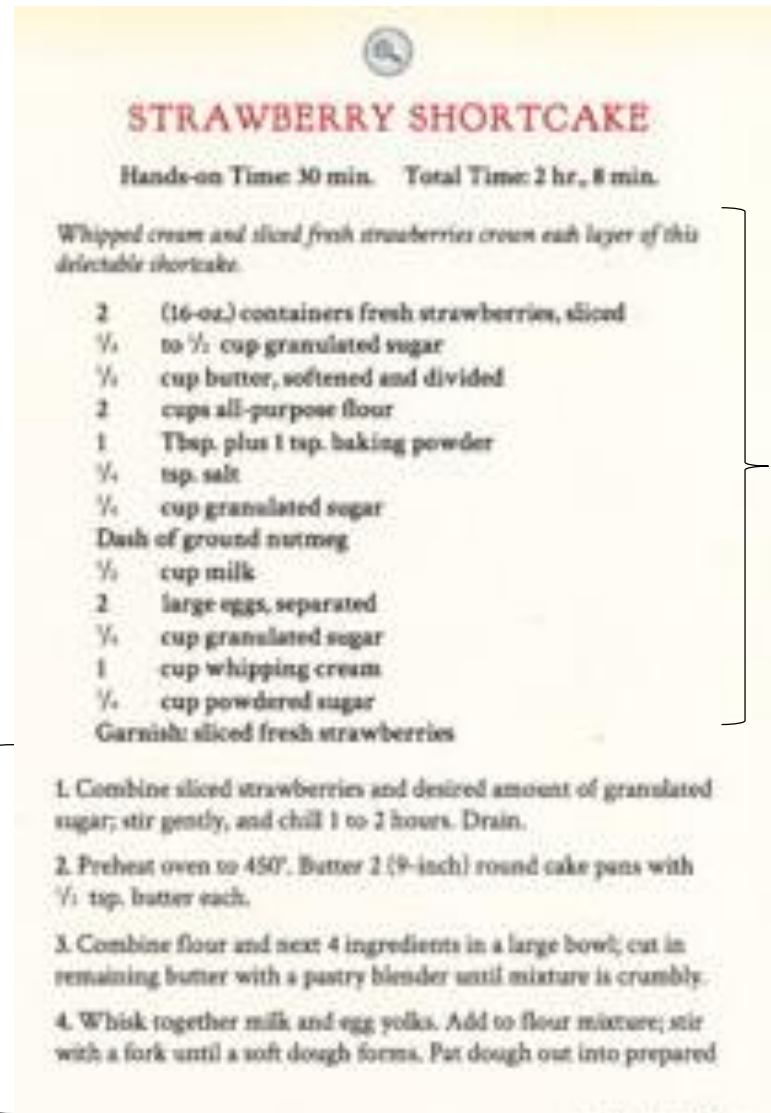
“Data Structures & Algorithms”

Prerequisite: C Programming Language

Md. Saidul Hoque Anik
onix.hoque.mist@gmail.com

Data Structure & Algorithms

Where do they fit in a program?



STRAWBERRY SHORTCAKE

Hands-on Time: 30 min. Total Time: 2 hr., 8 min.

Whipped cream and sliced fresh strawberries crown each layer of this delectable shortcake.

Ingredients:

- 2 (16-oz.) containers fresh strawberries, sliced
- $\frac{1}{4}$ to $\frac{1}{2}$ cup granulated sugar
- $\frac{1}{2}$ cup butter, softened and divided
- 2 cups all-purpose flour
- 1 Tbsp. plus 1 tsp. baking powder
- $\frac{1}{4}$ tsp. salt
- $\frac{1}{4}$ cup granulated sugar
- Dash of ground nutmeg
- $\frac{1}{2}$ cup milk
- 2 large eggs, separated
- $\frac{1}{4}$ cup granulated sugar
- 1 cup whipping cream
- $\frac{1}{4}$ cup powdered sugar
- Garnish: sliced fresh strawberries

Procedure:

1. Combine sliced strawberries and desired amount of granulated sugar; stir gently, and chill 1 to 2 hours. Drain.
2. Preheat oven to 450°. Butter 2 (9-inch) round cake pans with $\frac{1}{4}$ tsp. butter each.
3. Combine flour and next 4 ingredients in a large bowl; cut in remaining butter with a pastry blender until mixture is crumbly.
4. Whisk together milk and egg yolks. Add to flour mixture; stir with a fork until a soft dough forms. Pat dough out into prepared

Ingredients

Procedure

Structuring Data

Why is it important?



Structuring Data

Why is it important?



vs.



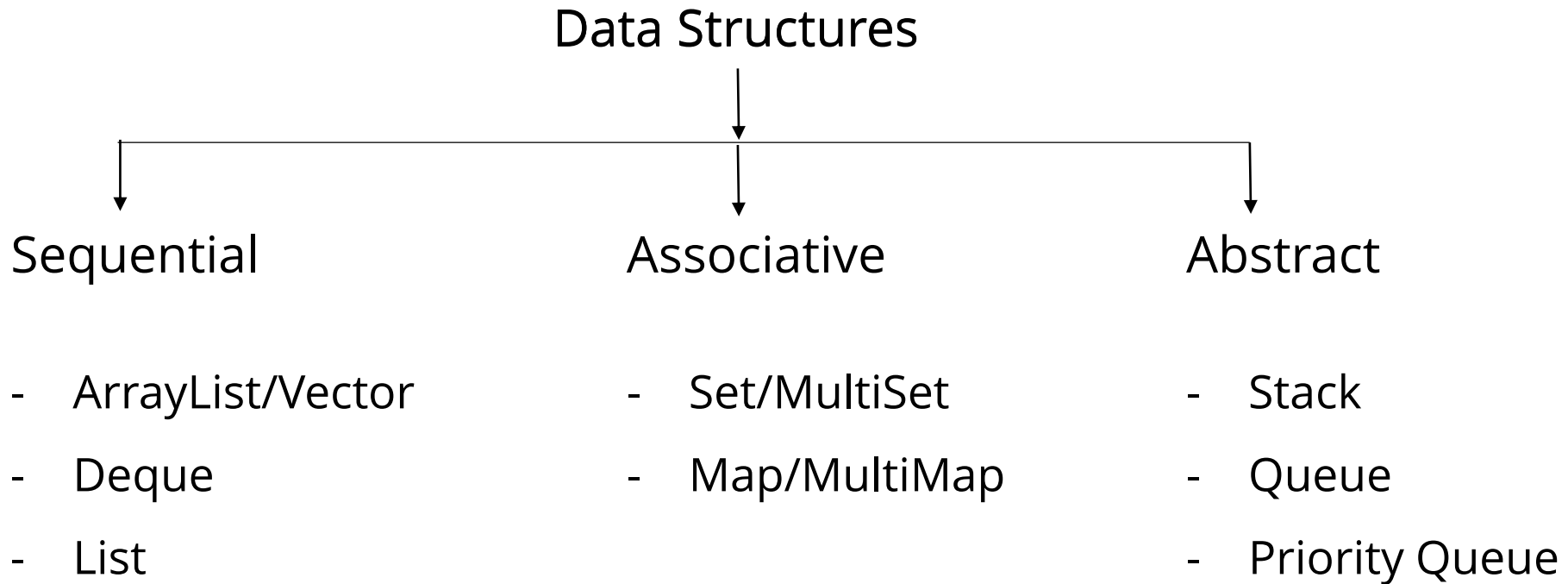
Structuring Data

Why is it important?

- Items can be easily retrieved (Access)
- Items are easily found (Search)
- New ingredients can be placed easily (Add)
- Old items can be removed easily (Delete)

Different Types of Data Structures

Based on Operation



Abstraction

A Data Structure











← add(...)

← delete(...)

← get(...)

← search(...)

Implementation of Static ArrayList

Edit	GroceryList	Sort
<input type="checkbox"/>	Bread	
<input type="checkbox"/>	Apple	
<input type="checkbox"/>	Banana	
<input type="checkbox"/>	Juice	
<input type="checkbox"/>	Tissue	
<input type="checkbox"/>	Toothpaste	
<input type="checkbox"/>	Clothes	
<input type="checkbox"/>	Snacks	
<input checked="" type="checkbox"/>	Milk	
<input checked="" type="checkbox"/>	Candy	

Regular Operations:

- Add (at the end)
- Edit
- Get n^{th} item
- Update n^{th} item
- Search for an item

Advanced Operations:

- Find min
- Find max
- Insert in middle

Analyzing Runtime

The Big O Notation – A Family of algorithms

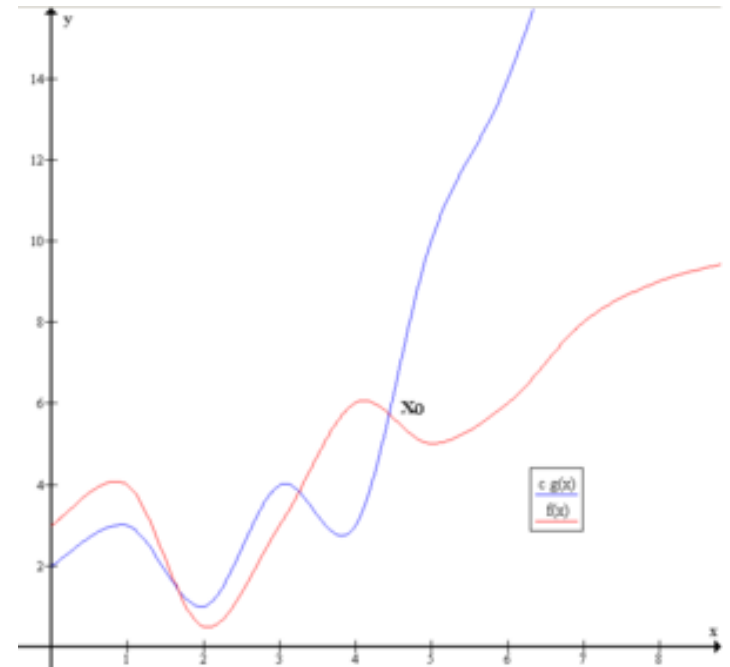
$$f(x) \in O(g(x))$$

as there exists

$c > 0$ (e.g., $c = 1$)

x_0 (e.g., $x_0 = 5$)

&
such that $f(x) \leq cg(x)$ whenever $x \geq x_0$.



Some Common Big O notations

- i.* $O(1)$
- ii.* $O(\log_2 n)$
- iii.* $O(n)$
- iv.* $O(n \log_2 n)$
- v.* $O(n^2)$
- vi.* $O(n^3)$