

Container Basics

A Collection of Classical Containers

CSCI 3700 — Data Structures and Objects

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Outline

- 1 Abstract Data Types
 - Abstract Data Types
 - Data Structures

- 2 Container Basics
 - The Basic Containers
 - Common Container Actions

What is an Abstract Data Type?

Please don't say "A data type that's abstract"

An *abstract data type* (or *ADT*)...

- Describes what data the ADT contains
- Describes the actions / behaviors the ADT must support

But...

An ADT does *not* specify *how* to store the data or perform the actions!

Implementing ADTs

Creating a concrete data type

- Specify how data is stored
- Specify type of data to be stored
- Write functions to implement all actions

The result

The result of this process is an *implementation* of an ADT — a *class*

The Role of Data Structures

After all, it *is* in the course name

ADTs are containers that store data

- Each is tailored to enable certain actions
- *Data structures* are mechanisms for storing data
 - They allow *efficient* data access in the way an ADT specifies
- Data structures are part of the *implementation* of an ADT

The Basic Containers

We'll see each of these this semester

- Dictionary
- Stack
- Queue
- Linear List
- Tree
- Sorted Linear List
- Heap
- Graph

Common Container Actions

All containers can do these

There are five actions common to all ADT containers:

- Create
 - Initializes a new container (the constructor)
- isEmpty
 - Returns true if the container is empty
- Size
 - Returns the number of items in the container
- Clear
 - Empties the container, allows reuse
- Destroy
 - Like clear, but also destroys container (the destructor)

Summary

- Abstract data types specify what a container can hold and do
- ADTs do not specify how to hold data or how to perform actions
- Concrete data types (classes) specify the programming details
- Data structures allow actions to be done efficiently
- All basic containers have five basic actions