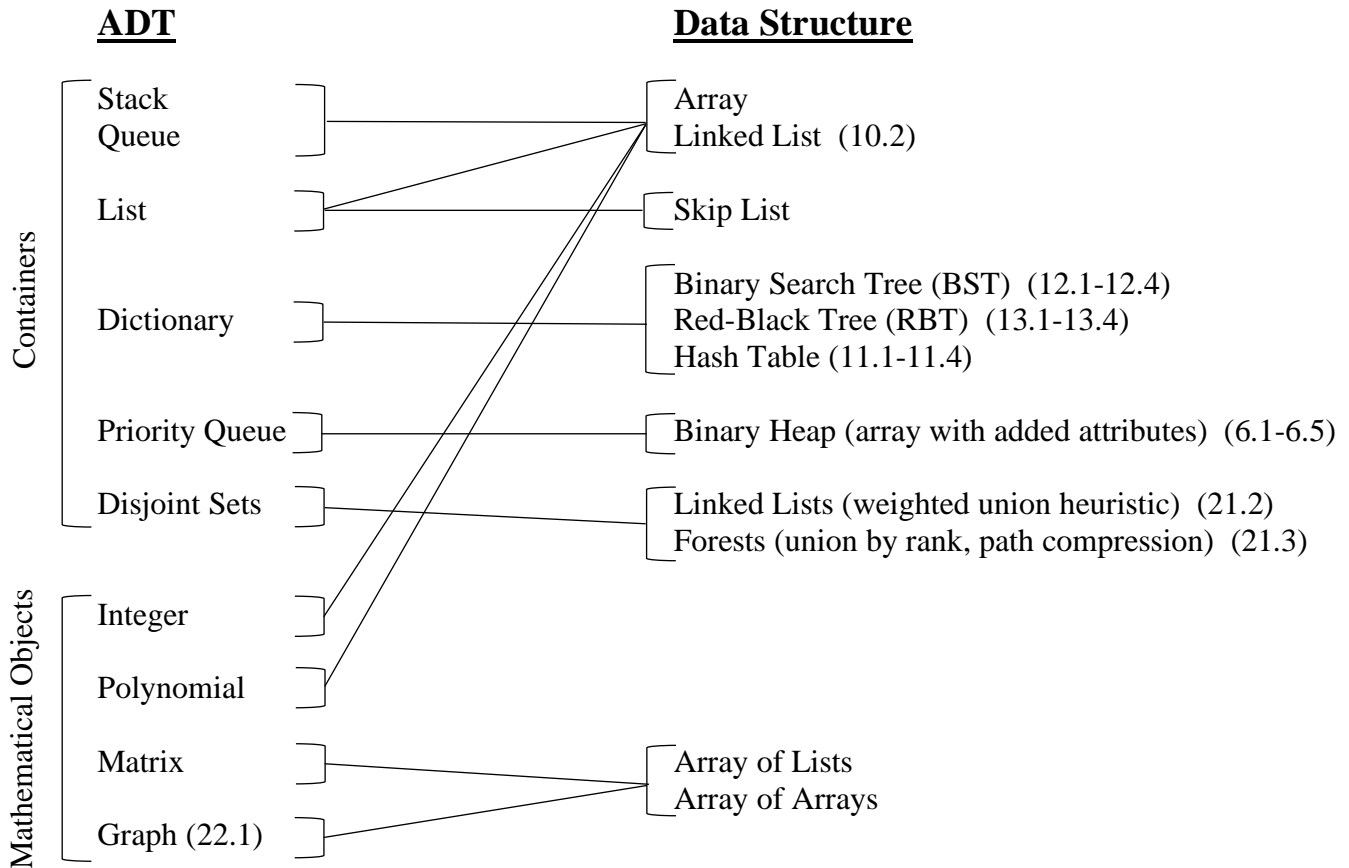# CSE 101
Introduction to Data Structures and Algorithms
ADTs and Data Structures

An *Abstract Data Type* (ADT) is a mathematical model of a data type. It is defined by a collection of operations on the data type, as seen from the point of view of a user. A *Data Structure*, on the other hand, is a concrete implementation of a data type, defined by a specific organization and storage format. Data Structures are the raw materials out of which ADTs are implemented. We list here a few ADTs and the Data Structures that may be used to build them.

ADT   Data Structure

Containers

Stack
Queue   Array
                                          Linked List (10.2)
List   Skip List

Dictionary   Binary Search Tree (BST) (12.1-12.4)
                                          Red-Black Tree (RBT) (13.1-13.4)
                                          Hash Table (11.1-11.4)

Priority Queue   Binary Heap (array with added attributes) (6.1-6.5)

Disjoint Sets   Linked Lists (weighted union heuristic) (21.2)
                                          Forests (union by rank, path compression) (21.3)

Mathematical Objects

Integer

Polynomial

Matrix   Array of Lists
                                          Array of Arrays
Graph (22.1)

Readings from Cormen, Leisersen, Rivest and Stein (CLRS)
The following summary is a (non-chronological) summary of the sections in CLRS that will be covered in this course.

Asymtotic Growth	3.1-3.2
Heaps and Priority Queues	6.1-6.5
Stacks, Lists and Queues	10.1-10.2
Hash Tables	11.1-11.4
Binary Search Trees	12.1-12.4
Red-Black Trees	13.1-13.4
Disjoint Sets	21.2-21.3
Basic Graph Algorithms	22.1-22.3
Weighted Graph Algorithms	24.1, 24.3