

**An Active Learning approach
to Data Structures
using C**

by Timothy A. Budd

This page is blank.

Table of Contents

Part 1 – Background

- Chapter 1: The Study of Data Structures
- Chapter 2: Algorithms
- Chapter 3: Debugging, Testing and Proving Correctness
- Chapter 4: Measuring Execution Time

Part 2 – Abstractions and Containers

- Chapter 5: Abstraction and Abstract Data Types
- Chapter 6: Stacks
- Chapter 7: Queues and Deques
- Chapter 8: Bags and Sets
- Chapter 9: Searching and Ordered Collections
- Chapter 10: Efficient Collections (skip lists, trees)
- Chapter 11: Priority Queues and Heaps
- Chapter 12: Dictionaries and Hash Tables
- Chapter 13: Graphs and graph algorithms
- Chapter 14: Searching and Sorting

Part 3 – Worksheets

- Worksheet 1: Recipes as Algorithms
- Worksheet 2: Describing Algorithms
- Worksheet 3: Recursive Algorithms
- Worksheet 4: Assertions and Invariants
- Worksheet 5: Testing and Boundary Cases
- Worksheet 6: Gnome Sort and Program Proofs
- Worksheet 7: Insertion Sort and Program Proofs
- Worksheet 8: Searching and Algorithmic Analysis
- Worksheet 9: Summing Execution Times
- Worksheet 10: Using Big-Oh to Estimate Wall Clock Time
- Worksheet 11: Recursive Functions and Recurrence Relations
- Worksheet 12: Merge Sort – A Fast Recursive Sorting Algorithm
- Worksheet 13: Quick Sort – A *Usually* Fast Sorting Algorithm
- Worksheet 14: Introduction to the Dynamic Array
- Worksheet 15: Amortized Constant Execution Time
- Worksheet 16: Dynamic Array Stack
- Worksheet 17: Linked List Introduction, List Stack
- Worksheet 18: Linked List Queue, pointer to Tail
- Worksheet 19: Linked List Deque
- Worksheet 20: Dynamic Array Deque and Queue
- Worksheet 21: Building a Bag using a Dynamic Array

Worksheet 22: Constructing a Bag using a Linked List
Worksheet 23: Introduction to the Iterator
Worksheet 24: Linked List Iterator
Worksheet 25: Bit Set
Worksheet 26: Ordered Bag using a Sorted Array
Worksheet 27: Sorted Array Sets
Worksheet 28: Skip Lists
Worksheet 29: Binary Search Trees
Worksheet 30: Binary Search Tree Iterator
Worksheet 31: AVL Trees
Worksheet 32: Tree Sort
Worksheet 33: Heaps and Priority Queues
Worksheet 34: BuildHeap and Heap Sort
Worksheet 35: Skew Heaps
Worksheet 36: Dynamic Array Dictionary
Worksheet 37: Hash Tables (Open Address Hashing)
Worksheet 38: Hash tables using buckets
Worksheet 39: Radix Sorting
Worksheet 40: Graph Representations
Worksheet 41: Depth-first and Breadth-first search
Worksheet 42: Dijkstra's algorithm

Appendix

Appendix A: The use of C in this text

Missing items:

Chapter 2, page 9: Binomial coefficient representation
Chapter 3, page 7: better picture
Chapter 3, page 12: Formulas printed better (summation)
Chapter 4: Picture is from MS clip art, should be replaced
Chapter 4, page 3: better picture of drop on windscreen
Chapter 6: many pictures missing
Chapter 10: Lots of formula need rewriting in word
Chapter 14: Could stand to have a few more illustrations.
Worksheet 16: missing pictures
Worksheet 31: Russian names