

CSCI 136 – Fundamentals of Computer Science II

Exam 1 Study Outline

I. Overview

- A. Application Programming Interface - API
- B. Test `__main__`
- C. Required comment format

II. Dynamic Lists/Arrays

- A. Operations on Lists
- B. Performance Issues with Operations

III. Performance

- A. Scientific Method
- B. Performance Metrics
 - 1. Time
 - 2. Space
- C. Empirical Analysis
 - 1. Doubling Hypothesis
 - 2. Making Predictions
- D. Order of Growth
 - 1. Relationship of Nested Loops and Growth

IV. Linked Lists

- A. Sequential vs. Linked
 - 1. Advantages / Disadvantages
- B. Structure of a Linked List
 - 1. Node Class
- C. Building a Linked List
- D. Traversing a Linked List
- E. Operations on a Linked List
 - 1. Add / Insert
 - 2. Remove

V. Stacks and Queues

- A. Abstract Data Types (vs Data Structures)
- B. Stack ADT
 - 1. LIFO (Last-In First-Out)
 - 2. Push / Pop
- C. Queue ADT
 - 1. FIFO (First-In First-Out)
 - 2. Enqueue / Dequeue

VI. Abstract Data Types, Generics

- A. Objectives
 - 1. Reduce Duplication
 - 2. Reduce Complexity
- B. Utilizing Inheritance
- C. Abstract Base Classes
- D. Generic Data Types

E. Multiple Inheritance

1. Issues with Multiple Inheritance
2. "Interfaces" in Languages without Multiple Inheritance

VII. Recursion

A. Definition

1. Divide and Conquer Approach

B. Relationship to Mathematical Induction

C. Components

1. Base Case(s)
2. Reduction or Induction Step

D. When NOT to use Recursion

E. System Call Stack

1. How it Allows Recursion
2. Stack Overflow

F. Examples

1. Factorial
2. Binary Search
3. Collatz Sequence
4. Fibonacci Sequence (NOT)
5. Brownian Motion
6. Merge Sort
7. H-Tree
8. Plasma Cloud