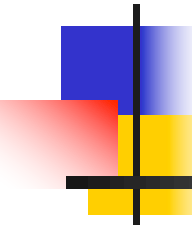

Introduction

CptS 223 – Advanced Data Structures

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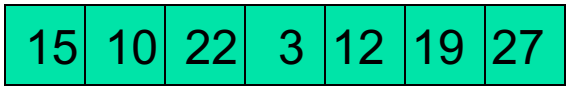
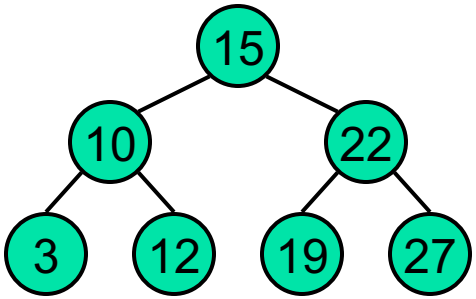
Advanced Data Structures

- "Why not just use a big array?"
- Example problem
  - Search for a number k in a set of N numbers
- Solution #1
  - Store numbers in an array of size N
  - Iterate through array until find k
  - Number of checks
    - Best case?
    - Worst case?
    - Average case?



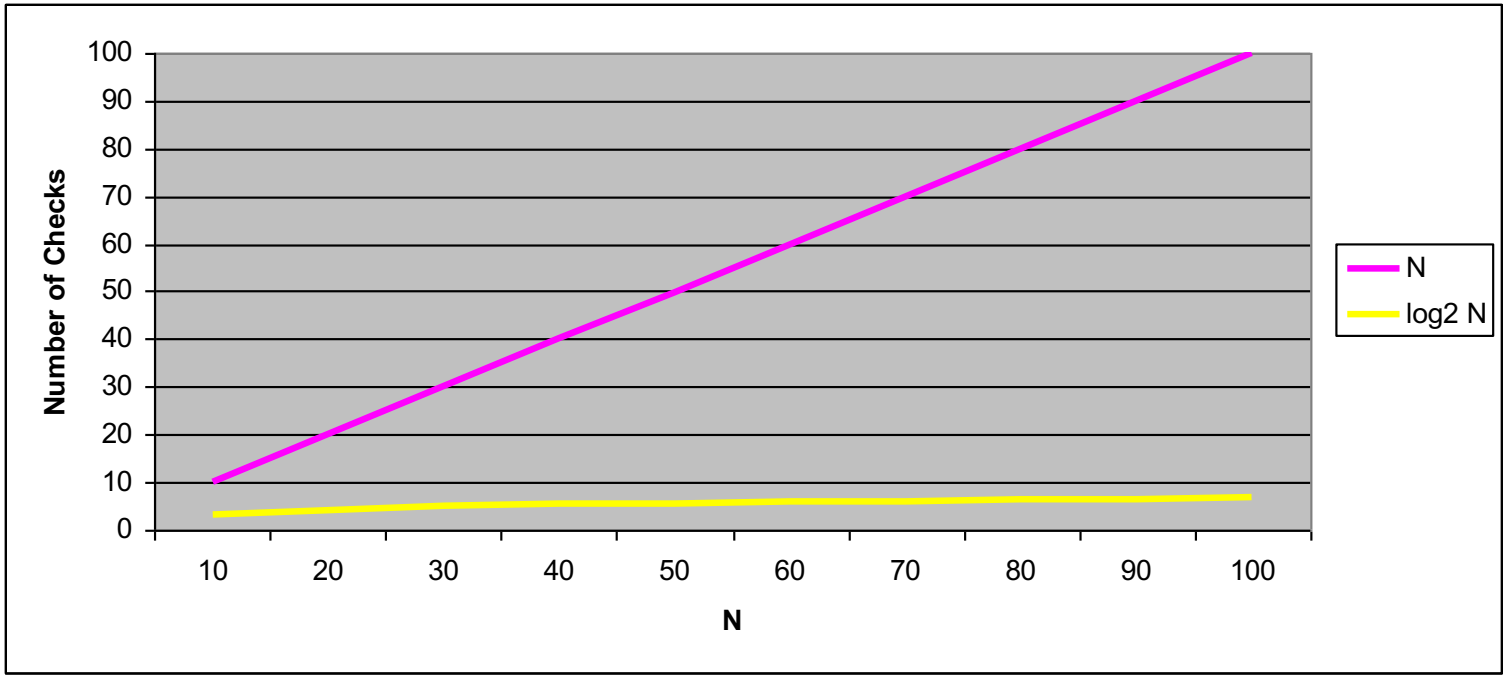
Advanced Data Structures

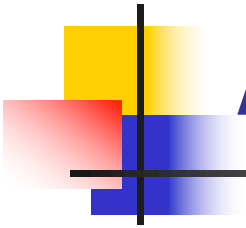
- Solution #2
  - Store numbers in a balanced binary search tree
  - Search tree until find k
  - Number of checks
    - Best case?
    - Worst case?
    - Average case?



Analysis

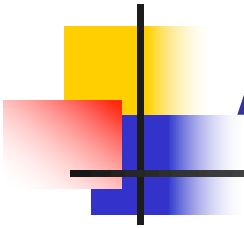
- Does it matter?
  - N vs. ($\log_2$ N)





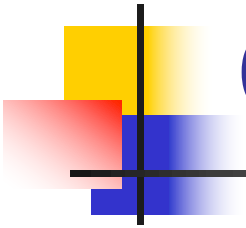
Analysis

- Does it matter?
- Assume
  - N = 1,000,000,000
    - 1 billion (Walmart transactions in 1 month)
  - 1 Ghz processor = 10^9 cycles per second
- Solution #1 (10 cycles per check)
  - Worst case: 1 billion checks = 10 seconds
- Solution #2 (100 cycles per check)
  - Worst case: 30 checks = 0.000003 seconds



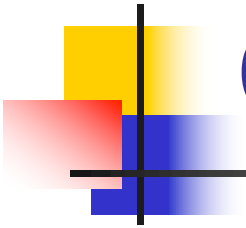
Advanced Data Structures

- Moral
  - Appropriate data structures ease design and improve performance
- Challenge
  - Design appropriate data structure and associated algorithms for a problem
  - Analyze to show improved performance



Course Overview

- Advanced data structures
  - Trees, hash tables, heaps, disjoint sets, graphs
- Algorithm development and analysis
  - Insert, delete, search, sort
- Applications
- Object-oriented implementation in C++



Course Details

- Everything on Canvas
  - Syllabus
  - Schedule
  - Lecture notes
  - Homework assignments
  - Exams