

Study guide for CS165 final exam (Comprehensive)

By now, you should be able to interpret or write a Java program that uses any of the items shown below.

1) Recursion

- a. Stack model for recursion
- b. Helper methods
- c. Memoization
- d. Hanoi, PentagonPark, Spock

2) Classes & Objects

- a. Classes versus Objects
- b. Class variables (static)
- c. Instance variable (non-static)
- d. Class and Instance methods
- e. Scoping of variables
- f. Class constructors
- g. Object references
- h. public versus private data and methods
- i. Getter and Setter methods
- j. Arrays of objects
- k. this keyword

3) Inheritance

- a. Super and Sub Classes
- b. **extends** keyword
- c. **super** keyword
- d. Constructor chaining
- e. **Overriding** methods
- f. **Overloading** methods
- g. Polymorphism and casting
- h. Dynamic binding
- i. **instanceof** operator
- j. **equals** and **toString** methods

- k. Access modifiers: **private**, **public**, **protected**

- l. **final** keyword

- m. Abstract Methods vs. Concrete Methods (differences)

- n. Sharing code via abstract class

4) Interfaces

- a. Only contains abstract methods
- b. Cannot contain concrete methods
- c. **implements** keyword
- d. Signature: Pure functionality (no implementation).
- e. Arrays of interface types can store any class that implements the interface
- f. Comparable

5) Data Structures

- a. Collections hierarchy
- b. Collection interface
- c. List interface
- d. Queue interface
- e. ArrayList class
- f. LinkedList class
- g. Stack class
- h. Collections class
- i. Comparable interface
- j. Comparator interface
- k. Iterators
- l. ArrayList implementation
- m. LinkedList implementation

6) Hashing

- a. Hashing functions
- b. Collisions
- c. Linear and Quadratic Probing, Double Hashing
- d. Separate Chaining (Hash Buckets)
- e. Dynamic Hashing – extendible

7) Priority Queues, Heaps

- a. Offer/add
- b. Complete binary tree
- c. Array storage
- d. maxHeap, minHeap
- e. Insert/delete
- f. HeapSort

8) Grammars, Expressions, Parsing

- a. Grammars / Production Rules
- b. Regular Expressions
- c. Infix, Prefix, Postfix Expressions
- d. Expression Trees
- e. Expression Evaluation

9) Trees

- a. Binary Trees
- b. Binary Search Trees (BST)
 - ✓ Searching
 - ✓ Inserting / Delete
 - ✓ Inorder, Preorder, Postorder, LevelOrder Traversal
- c. B+ Trees
 - ✓ Structure
 - ✓ Insert / Delete
 - ✓ Rotation
 - ✓ Bulk loading

10) Unweighted Graphs

- a. Data Structures
- b. Adjacency Matrices
- c. Adjacency Lists
- d. Depth-First Traversal (DFS)
- e. Breadth-First Traversal (BFS)
- f. Topological Sort