Final Exam: List of Topics - COP 3502 Spring 2020

Module 0: Introduction to Computer Science

- Know the basic computing device components and how they interact.
- Identify the differences between and functions of source code, machine code, and byte code.
- Articulate the process of compilation, its steps, and its purpose.

Module 1: Variables and Arithmetic

- Articulate the differences between variable declaration, initialization, and assignment.
- Identify valid/invalid and well-formed/poorly formed identifier names in Java.
- Be able to use and explain all arithmetic operators.
- Know the difference between floating point and integer types.
- Know the difference between the prefix and postfix increment/decrement operators
- Know how the integer division works. If either side of the division is a floating point number, the result should also be a floating point number. However, if both sides are integers, then the result should be an integer by discarding the fractional part.
- Be able to use the modulus properly.

Module 2: Program Control

- Be able to use if, if-else, and if-else chained statements.
- Be able to use switch statements.
- Be able to use while and do-while loops.
- Identify the relational operators, their uses, and how they differ.
- Be able to use nested selection and loop constructs.
- Evaluate short-circuit evaluation when applicable.
- Evaluate the tertiary (conditional) operator in context.
- Use a counting for-loop to iterate through a container / collection
- Trace through nested loop structures
- Identify the components of the looping constructs
- Identify the function and use of “break” and “continue” statements in loops
- Identify variable scope for variables in different code blocks

Module 3: Data Types

- Express the difference between different primitive data types, and their use cases.
- Use and understand the compound arithmetic operators.
- Know how constants differ from variables, and how they are used.

- Know how type conversion works for primitive types, and how to avoid problems when casting.
- Know the difference between explicit and implicit type-casting.
- Understand how to convert between different numbering systems (decimal, binary, octal and hexadecimal number system).
- Articulate how the String works as a reference type and know some of the frequently used built-in functions in the String class.
- Know the difference between instance and static methods.
- Be able to explain how enumerations work and how they are useful.

Module 4: Methods and Arrays

- Be able to invoke a method with arguments.
- Understand how a method with parameters acts on arguments when they are passed.
- Know how to build a method, how to accept parameters, and how to return a value.
- Articulate reasons behind use of methods rather than code duplication.
- Articulate the function of arrays and how they can be used.
- Know how elements of an array are stored in memory.
- Explain default values for arrays and the purpose they serve.
- Articulate how multi-dimensional arrays (including staggered arrays) work and how they are stored in memory.

Module 5: Software Engineering and Ethics

- Know how try and catch block is used for handling exceptions.
- Understand the difference between Errors and Exceptions.
- Know how an assert statement is used for unit testing.
- Understand the roles and responsibilities of an ethical computing professional.
- Know how to use version control to store and retrieve software versions. Know what clone, add, commit, pull and push commands do.

Module 6: Class

- Identify packages, classes, instances (objects), and their differences
- Identify the function of access modifiers (private, public, protected, and default)
- Build and use constructors, accessors (getters) and mutators (setters)
- Build, trace, and overloaded functions
- Articulate how overloading constructors works
- Articulate the function and use of the self-reference (“this”) keyword
- Articulate the differences between variable declaration, initialization, and assignment.
- Know how static variables / methods differ in function and use from non-static variables / methods

- Understand the difference between passing primitive types vs. passing objects as arguments

Module 7: Inheritance

- Know how access modifiers impact access to attributes and methods in Inheritance.
- Identify which attributes and methods can be accessed by a derived class.
- Articulate how overridden methods work and how the “super” keyword works.
- Know how to check the membership using the “instanceof” keyword.
- Understand how the constructors are invoked along the inheritance hierarchy.
- Know the difference between method overriding and overloading.
- Know the meaning of polymorphism and how it applies to inheritance.
- Know the features, use, and function of abstract classes.
- Know features, use & function of interfaces, and how they are similar to / differ from abstract class.
- Identify the difference between an “is-a” and a “has-a” relationship.

Module 8: Searching and Sorting Algorithms

- Articulate how linear search works
- Articulate how binary search works
- Understand the conceptual differences between linear and binary search in terms of performance
- Articulate the conceptual behavior of three sorting algorithms: Selection, Bubble and Insertion Sort
- Identify the performance of a code snippet in Big O notation.

Module 9: Recursion

- Know the two components (base case and recurrence relations) of a recursive solution.
- Be able to predict the output of a recursive function by constructing a recursion tree.
- Know how the recursive calls are invoked on call stack in different levels.
- Know how to use recursion in programs.
- Be able to identify the value and purpose of tail-recursion.