CS120 - Computer Science I

Course Review Fall 2014

Topics we covered:

- The basics:
  - Simple data types: `int`, `float`, `double`, `char`
  - Operators, expressions, statements, computer arithmetic
  - Basic I/O - `cin` and `cout`
  - Simple program structure, the preprocessor
- Decision statements:
  - Logical operators and expressions
  - `if` statement
  - `if-else` statement
  - Nested `if` statements
  - `switch-case` statement
- Looping statements:
  - Pre-test statements: `while`, `for`
  - Post-test statement: `do-while`
  - Looping examples and techniques: summation, iteration
- Functions:
  - Function syntax
  - Arguments, call-by-value, call-by-reference
  - Return values
  - Variable scope - local vs global
- Arrays:
  - Array declaration and syntax
  - Array initialization, array input/output
  - Array techniques, arrays and (for) loops
  - Arrays as function arguments
  - C-style strings (arrays of `char` terminated with the `NULL` character)
  - 2D arrays: rowwise vs columnwise operations
- Files (streams):
  - The standard streams: standard input `cin`, standard output `cout`, standard error `cerr`
  - Input streams (`ifstreams`)
  - Output streams (`ofstreams`)

- `structs`
  - `struct` declaration - a new type
  - Accessing members of structs
  - `structs` and arrays, arrays of `structs`
- Classes:
  - Concept of an "object"
  - Class members and methods - syntax
  - `public` and `private` class components
  - Class declaration, header files
  - Pointers to classes, dynamic class instantiation
  - Class examples, the C++ `string` class
- Pointers:
  - Pointer variables, declaration
  - The pointer operators, `&` and `*`
  - Arrays and pointers
  - Pointers and function arguments, call-by-reference
  - Dynamic memory, the `new` and `delete` operators
- Data Types - internal representation:
  - Base conversion: 2, 8, 10, and 16
  - Binary arithmetic
- Linked lists:
  - Dynamic memory allocation of linked list nodes
  - the `->` operator
  - declaring and initializing linked lists
  - Linked list operations: inserting and removing nodes, traversal
  - Deleting nodes
- Recursion:
  - Basic concepts - a function that calls itself
  - Necessary conditions:
    1. Problem can be expressed as a smaller version of itself
    2. A stopping case
  - How implemented: activation records, a stack
- Searching and Sorting:
  - Searching - linear, binary
  - Sorting - Basic ideas