Midterm Exam Review Topics

C++ Basics

1. Properties of C++.
2. C++ file types.
3. Stages of a program creation. Kinds of errors that can be discovered at each stage. Compilation and linking. What does each do? What files are needed? What files are produced?
4. C++ types: primitive (built-in) value types, class types, enum types, typedef, reference types, and pointer types.

I/O

1. Streams: cin, cout, cerr, and clog.
2. Handling files.
3. Manipulators.
4. Kinds of I/O errors and ways to handle them.
5. Error flags, their meaning and how they are set.

Classes and objects

1. The roles of a class.
2. Class elements and class structure.
4. Class member visibility: private, protected, public.
5. Differences between a class declaration and a class implementation. Importance of a class interface.
6. Constructing/destructing objects.
7. Different kinds and roles of constructors: ctors, copy constructors, default constructors, null constructor.
8. Initialization, assignment, copying of objects.

Functions and methods

1. Passing data to a function. What’s are the different ways to pass data to a function? Advantages of each method.
2. Receiving data from a function. How data can be passed back from a function? Can more than one value be returned?
3. What is the implicit argument to a function? What kinds of functions have implicit arguments?
4. Default parameters.
Pointers and references
1. L-values and R-values.
2. References vs. pointers.
3. Pointer R-values.
4. Notation for reference and pointer types.
5. Operators & and *.
6. How is an array like a pointer, and how does it differ?

Storage model
1. Storage classes: static, stack, heap.
2. new and delete.
3. Object lifetime.
4. Object size, sizeof.
5. Dangling pointers and their causes: failure to initialize, premature deletion of target.
6. Five kinds of failures. When different errors can occur?
7. Memory leaks - what they are, how they arise, how they can be detected and design patterns for avoiding them.
8. Memory management paradigms.
9. Difference between new and new [], delete and delete[].

C++ Standard Library
1. What is the C++ Standard Library and how can it be used?
2. Three classes: string, stringstream and vector.

Class dependencies
1. Tightly coupled classes.
2. Circular dependencies.
3. Introduction to UML (Unified Modeling Language).
4. Elementary design principles.

(Thanks to Ewa Syta for an earlier draft of these notes.)