Final Exam Review

CS 1428
Fall 2011

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Final Exam

- Friday, December 9, 11:00am to 1:30pm
- Derr 241 (here)
- Closed book, closed notes, clean desk
- Comprehensive (covers entire course)
- 25% of your final grade
- I recommend using a pencil (and eraser)
- All writing will be done on the test paper I will hand out.
- No calculators.

Exam Format

- 100 points total (or maybe 200)
  - Writing programs/functions/code (lots of this)
  - Multiple choice
  - Fill-in-the-blank/short answer
  - Tracing code (what is the output)
  - Finding errors in code

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Example Programming Problem

Write a function named bigNums that takes an array of integers and the number of integers in the array and returns a count of the number of integers in the list over 100.

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Example Tracing Problem

What will the EXACT output of the following code segment be?

```
int foo = 9;
string str = "Hey!";
float foo2 = 5.7;

while (foo2 < foo) {
    if (foo2 > 3.14) {
        cout << str << " bigger than PI!" << endl;
        foo = foo - 2;
    }
    else
        cout << foo << " in the else" << endl;
}
```

Chapter 1: Intro to Computer and Programming

- Hardware vs software

- Organization of hardware (diagram)

- Algorithm (set of instructions to perform a task)

- Machine lang vs low level lang vs high level lang

- Translation: source code file -> ... -> executable

- compiler/syntax errors vs. runtime errors

Chapter 2: Introduction to C++

- cout and << (output)
- Literals: numbers, characters, strings
- Rules for C++ identifiers and variables
- Variable Definitions and Initialization
- Assignment Statements
- Data Types
  - ⋆ int, short, long, float, double, bool, char
- Arithmetic operators
- Comments

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Chapter 3: Expressions and I/O

- cin and >> (input)
- Numerical Expressions: precedence rules
- Type Conversions: implicit and explicit
- Integer division vs float division
- Named constants
- Formatted output: setw, setprecision, fixed
- File I/O, filestream objects, open+close

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Chapter 4: Making Decisions

- Relational and Logical Expressions
    - ✶ Rel. Operators: <   <=   >   >=   ==   !=
    - ✶ Logical Operators: !   && ||
- Decision statements:
    - ✶ if
    - ✶ if-else
    - ✶ if-else if   (nested if)
    - ✶ block
    - ✶ switch

Ch 5. Loops

- while loop (general purpose loop)
- for loop (init; test; update)
- do-while (body done at least once)
- input validation
- count controlled loop, sentinel controlled loop
- keeping a running total
- nested loops, infinite loop
- increment decrement operators (as statements)
    - x++, ++x, x--, --x

Ch 6: Functions

- Function definition
- Function call (void vs one that returns a value)
- Function prototype
- Function parameters vs arguments
- Passing arguments by value and by reference
- Return statement
- Returning values from functions
- Scope: variables, local vs global
- Functions and Arrays
- Overloaded functions

Ch 7: Arrays

- Array declaration: size must be constant
- Array elements: syntax, range of subscripts
- Array initialization: `int list[] = {6,7,8};`
- Arrays of char: null char ('\0') at end
- Operations over arrays
    * input, output, sum, average, finding max, min
    * counting values that pass a test
    * array assignment (copy), compare for equality
- Partially filled arrays
- Lack of bounds checking

Ch 11: Structures

- Structure definition (members)
- Defining structure variables (having a struct type)
- Struct var initialization: `Student s1={"Bob",3.2};`
- Accessing members (dot operator)
- Operations over structures
  - * assignment, function call
  - * input/output, comparison (define yourself)
- Arrays of structure
- Nested structures

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Extra topics

- Binary representation
  - convert to/from decimal
  - arithmetic
  - sign+magnitude, 2's complement
- Bytes and Hex
  - bits, bytes, KB, MB, GB, TB
  - convert between hex and binary
- Characters and Strings
  - C-string vs string data type
  - assignment and comparison

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Extra topics

- Von Neumann machine (hardware organization)
  - stored program concept (instructions and data)
  - fetch-decode-execute cycle
- Searching
  - Linear search: understand the algorithm and code
- Sorting
  - Selection sort: understand the algorithm

How to Study

- Review the slides
  * understand all the concepts
- Look at questions at the back of the chapters
  * know how to use the concepts
  * know how to write code
- Understand the homework assignment solutions
  * rewrite yours so it works
- Understand the midterm exam problems
- Practice, practice, practice
- Get some sleep