



CMSC 131

Object-Oriented Programming I

Review

**Dept of Computer Science
University of Maryland College Park**

This material is based on material provided by Ben Bederson, Bonnie Dorr,
Fawzi Emad, David Mount, Jan Plane

Save Your Projects

- ▶ Make sure you save your projects (export them).
- ▶ The **CVS** repository will be removed once the semester is over
- ▶ Use a different folder for **CMSC132** (if you are taking that course)

Please Complete Evaluations

- ▶ https://www.irpa.umd.edu/Assessment/CourseEval/fac_faq.shtml

The “Big Picture”

- ▶ **Object Oriented Programming:** In this course we began an introduction to programming from an object-oriented approach
 - **Java** was the primary vehicle we used for programming.
 - This will continue in **CMSC 132** where you will learn more of the finer points of **object-oriented design**
- ▶ **Major Topics:**
 - Basic Elements:** types, variables, constants, operators, I/O
 - Control Flow:** if-else, switch, while, do-while, for
 - Classes:**
 - object instances and references
 - instance and class data
 - methods
 - Arrays:** 1-dim, multi-dim, ragged arrays, programming
 - Inheritance:** overriding, late-binding, interfaces

Basic Elements (of Java)

► Basic Elements:

- **Basic file structure:** File name, class structure, comments
- **Identifiers:** Naming rules and naming conventions
- **Primitive types:**
 - **Boolean**
 - **Integral types:** byte, (char), short, int, long
 - **Floating point types:** float, double
- **Strings:** and common String operators/methods
- **Specifying constants:** true, 'x', 12, 3124L, 3.14159e-10
- **Operators:** Their meaning and precedence rules

► Possible Questions:

- **Are these valid identifier names?** \$_Pasta_Fazool_22
- **Operator precedence:** $x * 2 + y --$
- **Is a cast needed?** float y = 2.0;

Control Flow

- ▶ **Control flow:**
 - **Conditionals:** if-else, switch
 - **Loops:** while, do-while, for
 - **Jumps:** break and continue
- ▶ **Possible Questions:**
 - **Trace the loop:** `for ( int i = 4; i < 10; i += 3 ) { ... }`
 - **Combining loops and conditionals:** Is a string a palindrome?
 - **Combining loops with arrays:** Insert an item into a sorted array
 - **Nested conditionals:** Given x, y, and z, return the smallest
 - **Nested loops:** Selection Sort
- ▶ **Avoid Pitfalls:**
 - Don't forget **breaks in switch** statements
 - Be sure you **understand** the problem **before coding**. (If not, ask)
 - **Test on a example** before and after coding

Classes

- ▶ **Class Objects and References:**
 - Creating object instances with **new**
 - The **null** reference
 - Java's class library
 - The **heap** and garbage collection
- ▶ **Basic Class Concepts:**
 - Instance (non-static) and class (static) variables
 - **Access modifiers** (public, private, protected, default (package))
 - **Constructors** (initializers)
- ▶ **Methods:**
 - Static and non-static
 - Arguments, call-return, and local variables
 - Return and **privacy leaks**

Classes

► Possible Questions:

- **Draw a memory map**
- **You be the compiler:**
 - We declare methods and create some objects, and
 - ... ask you which overloaded method is called, or
 - ... ask you whether access is valid/invalid
- **Class design:**
 - We specify the objects and functionality
 - You design the class: instance variables, constructors, methods

► Avoid Pitfalls:

- **Call the right method:** Determine which overloaded function to call, then check its accessibility
- **Read your old programs:** Eclipse fills in many things for you automatically. Be sure you can do it on your own
- **Deep/Shallow copy:** For a deep copy, create new object instances

Arrays

- ▶ **Arrays:**
 - Creating, indexing
 - Arrays of primitives and object references
 - 2-dimensional arrays and ragged arrays (array of arrays)
- ▶ **Possible Questions:**
 - **Array manipulation:**
 - Inserting/Removal/Searching in partially filled arrays
 - Appending/Merging arrays
 - Shifting, rotating, permuting elements in an array
 - **2-dim array manipulation:**
 - Appending arrays
 - Transposing arrays (inverting rows and columns)
- ▶ **Avoid Pitfalls:**
 - **Allocation:** Remember to explicitly allocate array/element storage
 - **Simplify:** Break complex operations into smaller/simpler pieces
 - **Inside-Out:** Design nested loops from the inside-out

Inheritance

► Inheritance:

- **Terminology**: base class (superclass), derived class (subclass), super (parent class)
- **Method overriding** (vs. overloading), late-binding, and final
- **up-** and **down-casting**, getClass and instanceof
- **Multiple inheritance** and **interfaces**

► Possible Questions:

- **Be the compiler**: We give code. Which method is called?
- **Design**: We give the specs, you design the classes and methods

► Avoid Pitfalls:

- Overriding only occurs when prototypes are identical. Start at the declared class, and go to the derived class if overriding applies

Miscellaneous

► **Miscellaneous Topics:**

- **Javadoc:** @tags and their usage: @author, @param, @returns, ...
- **Java Class Library:** Math, ArrayList, ...
- **Unix commands**
- **Packages:**
 - Organizes Java files into groups (directories)
 - Packages may be subdivided into subpackages
 - You have access to names in your own package or packages you import
- **Exceptions:**
 - try-catch blocks and exception propagation
- **Comparable interface**

► **Possible Questions:**

- Know common methods for **String** and **ArrayList**. For others know the basic concepts (Stack: push, pop, peek) but not details
- **Package:** What is accessible with/without importing?
- **Exception:** Design/trace try-catch blocks

What's Coming Up?

- ▶ **CMSC 132:** You will learn more about object oriented programming in greater depth, still in Java
 - More on software testing (JUnit) and debugging
 - I/O and exceptions
 - Recursive functions
 - Linked data structures
 - Networking
- ▶ **CMSC 216:** Low-level programming concepts
 - C programming
 - Memory allocation and deallocation
 - Internal representations of arrays and data structures
 - Computer organization
- ▶ **CMSC 250, 351:** Discrete math and algorithm design
- ▶ **CMSC 330:** Programming languages