

Objects in Programming

Final Test Review

Outline

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- Format
 - Topics

Format – Taking the test

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- 2 hours
 - At the MECC
 - Open book
 - Bring whatever notes/books you would like
 - Subject to approval by the staff at the test site
 - They are a separate organization that has its own rules
 - No electronics allowed (laptops, phone, etc.)
 - The test itself is taken on a computer, which will be provided
 - There will be no IDE, compiler or network access

Format – Question types

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- True/False
 - Given some code, find the errors
 - Given some code, what does this code print?
 - Given a problem description, write code that solves the problem

Format – Question types

- Find errors

- By line number
- One error per line
- Compile-time errors are allowed
- Checked exceptions can occur
- No errors depend on the value of a variable or input values

- Types of errors

- Syntax (missing braces, parentheses, semi-colons, etc.)
- Other (attempting to access a private field outside an object, accessing an instance field from a static method, no permissions to write to a file, etc.)

Format – Question types

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- What does this code print?
 - Code is correct – it does not throw an exception or crash
 - For all code given, you can assume that all the correct imports are used
 - They are omitted in the test to save space
 - It is possible that restrictions are placed on the code
 - For example, it may be stated that the code does/does not have permissions to open a file
 - Or that a certain input variable is positive, or not a number, or that a file is empty, etc.
 - Try to be as close as reasonably possible to exactly what would be printed
 - Avoid extra commas, dashes, etc.

Format – Question types

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- Writing a GUI
 - Expect about a page or so of code
 - You can ignore import clauses
 - We will assume they are there
 - Try to avoid major syntax errors
 - Swing and AWT

Topics – Methods

- Signatures
 - Know what makes up a method's signature
 - Be able to overload and override methods
 - Given two or more method definitions, know which one is called in a specific case
- Parameters – know the difference between objects and primitive types
 - Primitive types (int, float, char, etc.) are passed by copy and any changes do not stick after the method ends
 - Objects are passed by reference and any changes made by calling methods on the object do stick after the method ends

Topics – Classes and Interfaces

- Classes

- Have constructors
- Can have private, protected and default fields and methods
- Can use new to create objects

- Interfaces

- No constructors
- Only have public methods and static fields
- Cannot create new objects
- But can declare variables and parameters of interface type

Topics – Classes and Interfaces

- Abstract classes

- Know the difference between an abstract class and a non-abstract (concrete) class
- Be able to declare an abstract class
- Be able to inherit from an abstract class and create a concrete one

Topics – Inheritance

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- Inheritance
 - Singly-rooted inheritance tree
 - Object at top
 - Descendants and ancestors
 - Immediate and remote
 - How to extend a class
 - Syntax
 - Single inheritance of classes
 - Only classes can extend classes

Topics – Inheritance

- How to implement an interface
 - Syntax
 - Multiple inheritance of interfaces
 - Both classes and interfaces can implement interfaces
- Know how to make fields available/hidden from subclasses
- Overloading vs overriding
 - The difference
 - How to do each
 - Effect of **private** keyword

Topics – Inheritance and Constructors

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- Constructor chaining
 - Default behavior
 - Calling the parent class constructor using `super()`
 - Calling `super` with arguments
 - Calling the parent constructor first
 - The default constructor
 - What is it?
 - How do you get one?
 - What does it do?
 - Relationship to no-argument constructor

Topics – Inheritance and Polymorphism

- Relationship

- If class C extends class P, then an object of class C can be used whenever an object of class P could be used

- Effect on

- Which methods can be called from class C
 - Which fields are visible both within and outside of class C

- Use in

- Parameters
 - Variable declaration

Topics – Access Control

- Access Control Modifiers
 - `public`, `private`, `protected` and default
 - Know what effect these have on when fields and methods can be seen/used
 - Both in general
 - And in terms of inheritance/polymorphism
- The Encapsulation Principle
 - Make all fields private and add public setters and getters
 - The difference between the interface (what is available outside the class) and the implementation (how the work is actually done, usually private to the class)

Topics – Static and Non-static

- Static fields

- Where they can be accessed from
- A static field has the same value over all objects of the same class
- Static fields are accessed through the class

- Non-static fields (aka instance fields)

- Where they can be accessed from
- An instance field can have different values over objects of the same class
- Instance fields are accessed through objects

Topics – Static and Non-static

- Static methods

- Where they can be accessed from
- Static methods are accessed through the class
- Static methods cannot access instance variables (except through objects)

- Non-static methods (aka instance methods or just methods)

- Where they can be accessed from
- Instance methods are accessed through objects
- Instance methods can access static variables

Topics – GUI

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- No JavaFX
 - Swing and AWT
 - Be able to
 - Open a window
 - Add a panel, buttons, text field, dropdowns, etc.
 - Handle any events
 - Draw geometric objects (rectangles, circles, lines, etc.)

Topics – Exceptions

- Given a method that throws an exception, be able to write a try-catch block that catches that exception
- Define an exception class
- Explicitly throw an exception
- Define a method that throws a checked exception
- Know the difference between
 - Errors
 - Unchecked exceptions
 - Checked exceptions

Topics – I/O

- Files

- Open a file
- Read character data out of it
- Write character data to it
- Close it

- Character data includes primitive types (int, float, char) and Strings