



Introduction to
Object-Oriented Programming,
Java,
and
Interactive Development Environments

Dr. Eric Becker
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What is Object-Oriented Programming?

- Programming has changed over time
 - A single sequence of commands
 - One single main program
 - A sequence of procedures
 - Functions and a main program
 - A set of objects
 - Functions and Data combined, with a main program

Objects and Classes

- Object Oriented Programming will have classes for a user defined data types.
- The idea is that a class contains related functions and data.
- For example, a programmer would not want to create a class containing information about both cars and fish.
- Unless it was an amphibious car...

Objects and Classes

- Encapsulation
- Putting the Data and Functionality in a single structure
 - The Data about an object
 - Member Fields, Data Fields, Data Members,
 - The Functions about an Object
 - Member Functions, Methods

Objects and Classes

```
package simon;

public class TeaCup
{
    //Here are Class Variables
    double capacity; //Volume in ounces
    String label; //Description of Decal
    int color; //Describing the color, 1=black, 2=white, 3=red, 4=blue

    //Here is a constructor
    public TeaCup()
    {
        capacity=0.0;
        label="Tea";
        color=1;
    }

    //Here are the Class Functions (methods)
    public void fill(double volume)
    {
        capacity=capacity+volume;
    }

    public void setDecal(String newLabel)
    {
        label=newLabel;
    }
}
```

Classes and Objects

- When data and functions become too complex
- Simplify by putting like pieces together.
- Simplify by putting like functions together.
- Now the system can be even bigger and even more complicated!

What is Java?

- Java is a virtual machine programming language
- The virtual machine runs on different platforms. (Apple, PC Desktop, Linux, etc.)
- The Java class files then run on any version of the virtual machine.
- This gives cross-platform performance.

Running a Java Application

- Create a class with main.
- Compile into a Java class file.
- Use the Java machine with a proper class path.
- What does this look like?
 - Either command line
 - Or from using an IDE

What are Interactive Development Environments?

- Programming languages can be done from command line (a terminal) or from an Interactive Development Environment (IDE)
- IDE provides extra organizational and viewing tools
- Debugging tools are available in IDE, including watches and breakpoints.

How to Write a Java Program

- Method 1: Text Editing
 - EMACs, VI, TextEdit
- Method 2: Using an IDE
 - Netbeans
 - Eclipse
 - BlueJ

Running a Java Application

- Create a class with Main.
- Compile into a Java class file.
- Use the Java machine with a proper class path.

The Debugger

- As programs become more complicated, more tools are available.
- Two basic debugging components are:
 - The Breakpoint
 - The Watch Box

The Debugger

- The Breakpoint is a toggle on each line of code.
- Best to be at a key point of code, where something will happen.
- Even adding a print statement to give a place to use a breakpoint.

The Watchbox

- The Watchbox will show the current active memory.
 - Namespace, Objectspace, Memory, Allocation
- Should show the class, the object, and the active variables at the time the program halts.
- Plan for expected values.

A digital landscape featuring a blue sky with scattered white clouds. A full moon is visible in the upper left quadrant. Below the sky is a body of water that reflects the moon and the sky. The text "Time for Demonstrations" is centered in the middle of the image.

Time for Demonstrations