Objects and Classes
Lecture 1

Waterford Institute of Technology

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John Fitzgerald

Fundamental Programming

Course Content

Course comprises

- Lectures
- Labs
  - Exercises
- Assignments
  - Closely related to Exercises

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Course Content

Lectures

Lectures

- Closely based on textbook
  Objects First with Java
  (3rd & 5th editions).
- Advanced topics based on Udacity MOOC
  - Lecture introduces new material
  - Gist of lecture applied in lab

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Course Content

Primary materials sources

Labs

- Labs loosely coupled with lectures
- Materials used in preparing course content:
  - *Objects First* textbook
  - Oracle's *The Java Tutorials*
  - Udacity *Intro to Programming*
  - ICTSkills Web Development labs

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Programming

Learning tips

Learn to program by

- Reading supplied code,
- Writing your own code.

Complete all labs.

- Do not rush through the labs.
  - Read and reflect on the supplied lab code and descriptive material.
- Complete exercises.

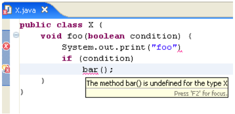
Interact and share information with colleagues.

Computer Language

Communicates instructions to computer

Often split into components

- Syntax (form)
    - Set of rules defining how program written
    - Usually easy to detect syntax errors
- Semantics (meaning)
    - Code may be syntactically correct
    - But deliver incorrect results
    - Frequently difficult to detect



```
public class X {
    void foo(boolean condition) {
        System.out.print("foo")
        if (condition)
            bar();
    }
}
```

The method bar() is undefined for the type X

Press 'F2' for focus.

Computer Languages

Wikipedia lists in excess of 600

Popular languages

- Java
- JavaScript
- PHP
- Python
- C
- C++
- Ruby

Computer program

What is it?

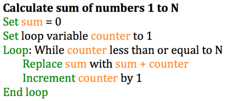
List of computer language instructions to a computer, for example:

- Web browser such as Firefox
- Office suite such as Open Office
- Video games
- A program to calculate area of circle

Pseudo code

Informal high-level description of program

- Human readable
- Logical plan to develop program
- No universally agreed standard
- Generic, language independent



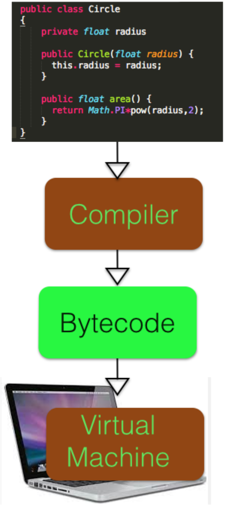
Calculate sum of numbers 1 to N

```
Set sum = 0
Set loop variable counter to 1
Loop: While counter less than or equal to N
    Replace sum with sum + counter
    Increment counter by 1
End loop
```

A Java application

How it's developed

- Write program (source code)
- Compile source to bytecode
- Run bytecode on Java virtual machine

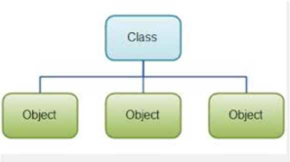


```java
public class Circle
{
    private float radius

    public Circle(float radius) {
      this.radius = radius;
    }

    public float area() {
      return Math.PI*pow(radius,2);
    }
}
```

Object Oriented Programming (OOP)

What is OOP?

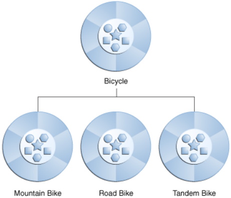
- A fundamental programming style
  - Represents concepts as objects
  - Objects: created from classes
  - Objects: contain data
  - Objects: have methods
  - Methods: can perform actions
  - Data: define state of each object
  - Methods: invoked or called



Object Oriented Programming

Why use it?

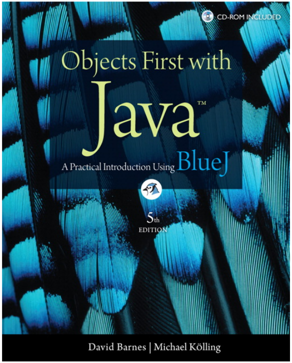
- Code reuse
- Encapsulation: hide data from class user
- Design benefits



Applying Object Oriented Programming

BlueJ

- Development environment: BlueJ
  - What is BlueJ?
  - Brief history
  - Strengths and weaknesses


CD-ROM INCLUDED
Objects First with
Java™
A Practical Introduction Using BlueJ
5th EDITION
David Barnes | Michael Kölling

Java Programming Language

Selected facts

- Developed at Sun Microsystems
- Released in 1995
- Oracle Corporation buys Sun (2010)
- Compiled to bytecode
- Runs on Java Virtual Machine (JVM)
- Computer-architecture independent
- One of most widely used languages

Integrated Development Environment (IDE)

What is an IDE?

- A software application
- Purpose: assistance to software developers
- Example IDEs
  - Visual C++
  - Eclipse
  - NetBeans
  - DrJava
  - BlueJ

IDE Components

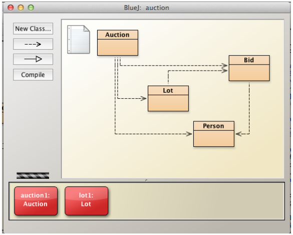
Typically included

- Text editor
- Build tools
- Debugger
- Unit testing
- Intelligent code completion
- Version control

BlueJ IDE

Description

- IDE for Java programming
- Designed for education
- Feasible for small software projects
- Fundamentally different to other IDEs
  - Graphical emphasis
  - Objects first
  - Incremental changes to existing code
  - Code samples represent realistic problems
  - Avoids starting with blank page



OOP teaching

Traditional approach

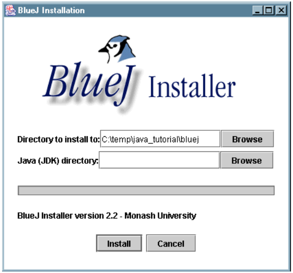
- Complex IDEs
  - Eclipse
  - NetBeans
- Large text books (1000 pages +)
- Begin with blank page
- Immediate introduction to many complex concepts
- OO concepts introduced several weeks into course

OOP teaching

BlueJ approach

BlueJ guidelines

- Simple IDE: BlueJ
- *Objects First with Java* compact textbook
- Begin with existing code
- Gradual introduction new concepts
- Immediate introduction of objects



Directory to install to: C:\temp\java_tutorial\bluej

Java (JDK) directory:

BlueJ Installer version 2.2 - Monash University