COMP 110
Designing Programs

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Announcements

- Office Hours
  - 1–2 PM today
  - Come if you don’t have Eclipse working
Review

- Is Java a high-level language or a low-level language?

- What does the following Java statement display onto the screen?
  
  ```java
  System.out.println("Java is great!");
  ```
Today in COMP 110

- Object-Oriented Programming
- Encapsulation, polymorphism, and inheritance
- Writing Algorithms in pseudocode
- Variables, arguments, statements, and syntax
Object-Oriented Programming

- Our world consists of objects (people, trees, cars, cities, airline reservations, etc.).

- Objects can perform actions which affect themselves and other objects in the world.

- Object-oriented programming (OOP) treats a program as a collection of objects that interact by means of actions.
Objects, appropriately, are called **objects**.

Actions are called **methods**.

Objects of the same kind have the same **type** and belong to the same **class**.
- Objects within a class have a common set of methods and the same kinds of data
- but each object can have its own data values.
OOP Design Principles

- OOP adheres to three primary design principles:
  - Encapsulation
  - Polymorphism
  - Inheritance
Encapsulation (Information Hiding)

- packing things up, only seeing part of what is going on

- Encapsulation provides a means of using the class, but it omits the details of how the class works.

- Encapsulation often is called information hiding.
A car consists of many parts and is capable of doing many useful things.

Important to the driver:
- Accelerator pedal
- Brake pedal
- Steering wheel

Not important to the driver:
- Fuel injectors
- Spark plugs
- Water pump
Polymorphism

- “many forms”
- Same instruction to mean same thing in different contexts.
  - Example: “Go play your favorite sport.”
    - I’d go play football.
    - Others of you would play baseball instead.
- In programming, this means that the same method name can cause different actions depending on what object it is applied to.
- More on this in Chapter 8.
Inheritance

- A way of organizing classes
- At each level classification becomes more specialized.
Introduction to Inheritance

- Classes can be organized using inheritance.

- A class at lower levels inherits all the characteristics of classes above it in the hierarchy.

- At each level, classifications become more specialized by adding other characteristics.

- Higher classes are more inclusive; lower classes are less inclusive.
A set of instructions for solving a problem

By designing methods, programmers provide actions for objects to perform.

An algorithm describes a means of performing an action.

Once an algorithm is defined, expressing it in Java (or in another programming language) is usually easy.
Get slice of bread from loaf and put on plate
Repeat until enough peanut butter
  ◦ Put knife into peanut butter jar and get peanut butter
  ◦ Transfer peanut butter from knife to slice of bread
Transfer other slice of bread from loaf to plate
Repeat until enough jelly
  ◦ Put knife into jelly jar and get jelly
  ◦ Transfer jelly from knife to other slice of bread
Put slice of bread (pb side down) on other slice of bread
Enjoy!
Pseudocode

- combination of code and English used to express an algorithm **before** writing algorithm into code
Vocabulary

- Variables – store a piece of data
- Statements – instructions to the computer
- Syntax – grammar rules for a language
- Arguments – information methods need to carry out its action
Homework

- Program 1 is on the web page
- We will look at code tomorrow that will help
- Honor pledge
Tomorrow

- Lab 1
- Programming help for Program 1