Java Programming Language SE - 6

Module 2 : Object-Oriented Programming

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Certified Professional
Java SE 6 Programmer

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Objectives

- Define object modeling concepts: abstraction,encapsulation and packages
- Discuss why you can reuse Java technology application code
- Define class, member, attribute, method, constructor, and package
- Use the access modifiers private and public as appropriate for the guidelines of encapsulation
- Invoke a method on a particular object
- Use the Java technology application programming interface (API) online documentation

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Relevance

- What is your understanding of software analysis and design?
- What is your understanding of design and code reuse?
- What features does the Java programming language possess that make it an object-oriented language?
- Define the term object-oriented.

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Software Engineering

The Analysis and Design Phase

- Analysis describes what the system needs to do:

  Modeling the real-world, including actors and activities, objects, and behaviors

- Design describes how the system does it:
  - Modeling the relationships and interactions between objects and actors in the system
  - Finding useful abstractions to help simplify the problem or solution

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Abstraction

- Functions – Write an algorithm once to be used in many situations
- Objects – Group a related set of attributes and behaviors into a class
- Frameworks and APIs – Large groups of objects that support a complex activity; Frameworks can be used as is or be modified to extend the basic behavior

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Classes as Blueprints for Objects

- In manufacturing, a blueprint describes a device from which many physical devices are constructed.
- In software, a class is a description of an object:
  - A class describes the data that each object includes.
  - A class describes the behaviors that each object exhibits.

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Classes as Blueprints for Objects

- In Java technology, classes support three key features of object-oriented programming (OOP):
  - Encapsulation
  - Inheritance
  - Polymorphism

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Declaring Java Technology Classes

- Basic syntax of a Java class:

  <modifier>* class <class_name> {

  <attribute_declaration>*

  <constructor_declaration>*

  <method_declaration>*

  }

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Declaring Java Technology Classes

```
public class Vehicle {
private double maxLoad;
public void setMaxLoad(double value) {
maxLoad = value;
}
}
```

Declaring Attributes

- Basic syntax of an attribute:

  <modifier>* <type> <name> [= <initial_value>];

- Examples:

```
public class Foo {
private int x;
private float y = 10000.0F;
private String name = "Bates Motel";
}
```

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Declaring Methods

Basic syntax of a method:

```
<modifier>* <return_type> <name> ( <argument>* ) {
<statement>*
}
```

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Declaring Methods

```
public class Dog {
private int weight;
public int getWeight() {
return weight;
}
public void setWeight(int newWeight) {
if ( newWeight > 0 ) {
weight = newWeight;
}
}
```

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Accessing Object Members

- The dot notation is: <object>.<member>
- This is used to access object members, including attributes and methods.
- Examples of dot notation are:

```
d.setWeight(42);

d.weight = 42; // only permissible if weight is public
```

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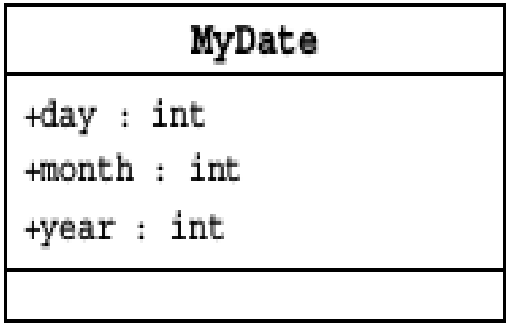
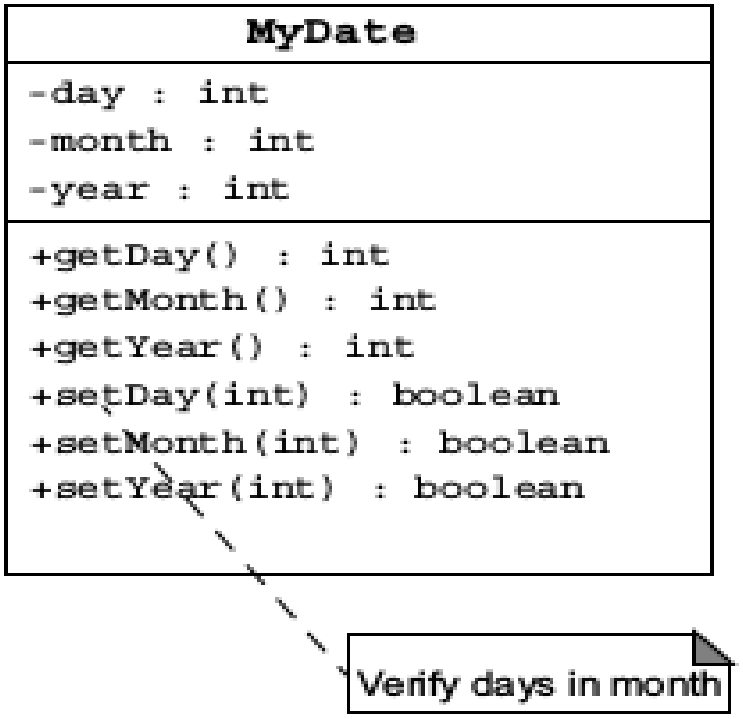
Information Hiding

The problem:



The solution:



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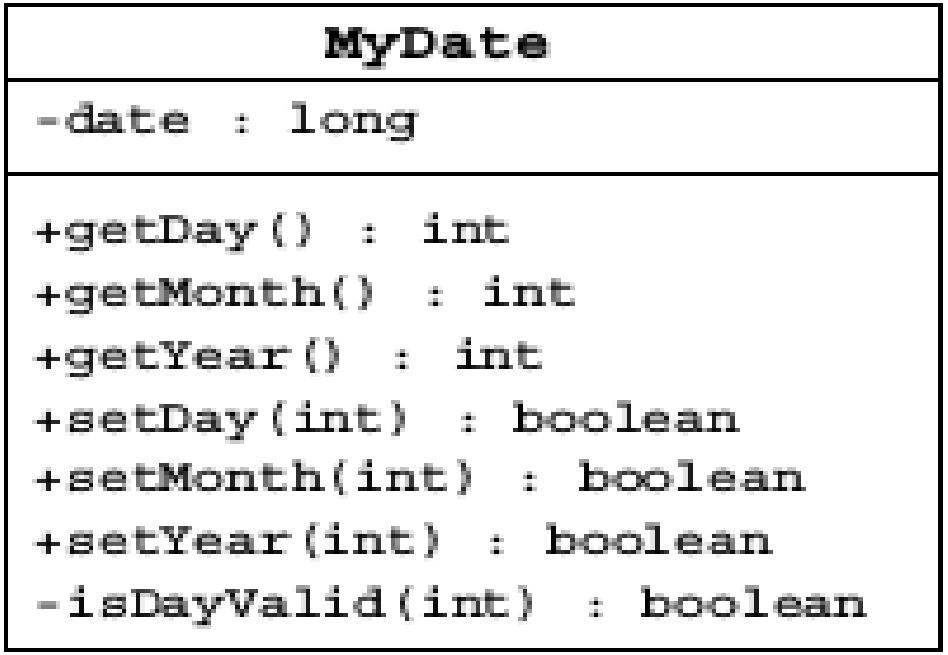
Encapsulation

- Hides the implementation details of a class
- Forces the user to use an interface to access data
- Makes the code more maintainable



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Declaring Constructors

- Basic syntax of a constructor:

  [<modifier>] <class_name> (<argument>*) {

  <statement>*

  }

- Example:

```
public class Dog {
private int weight;
public Dog() {
weight = 42;
}
}
```

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The Default Constructor

- There is always at least one constructor in every class.
- If the writer does not supply any constructors, the default constructor is present automatically:
  - The default constructor takes no arguments
  - The default constructor body is empty
- The default enables you to create object instances with new Xxx()without having to write a constructor.

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Source File Layout

- Basic syntax of a Java source file is:

  [<package_declaration>]

  <import_declaration>*

  <class_declaration>+

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Source File Layout

```
package shipping.reports;

import shipping.domain.*;
import java.util.List;
import java.io.*;

public class VehicleCapacityReport {
private List vehicles;
public void generateReport(Writer output) {...}
}
```

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Software Packages

- Packages help manage large software systems.
- Packages can contain classes and sub-packages.

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The package Statement

- Basic syntax of the package statement is: package
  - <top_pkg_name>[.<sub_pkg_name>]*;
- Examples of the statement are:
  - package shipping.gui.reportscreens;
- Specify the package declaration at the beginning of the source file.
- Only one package declaration per source file.
- If no package is declared, then the class is placed into the default package.
- Package names must be hierarchical and separated by dots.

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The import Statement

- Basic syntax of the import statement is:

  Import<pkg_name>[.<sub_pkg_name>]*.<class_name>;

  OR

  import<pkg_name>[.<sub_pkg_name>]*.*;

- Examples of the statement are:

  import java.util.List;

  import java.io.*;

  import shipping.gui.reportscreens.*;

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The import Statement

The import statement does the following:

- Precedes all class declarations
- Tells the compiler where to find classes

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Compiling Using the -d Option

cd JavaProjects/ShippingPrj/src

javac -d ../classes shipping/domain/*.java

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Recap

- Class – The source-code blueprint for a run-time object
- Object – An instance of a class;

  also known as instance
- Attribute – A data element of an object;

  also known as data member, instance variable, and data field
- Method – A behavioral element of an object;

  also known as algorithm, function, and procedure

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Recap

- Constructor – A method-like construct used to initialize a new object
- Package – A grouping of classes and sub-packages

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Java Technology API Documentation

- A set of Hypertext Markup Language (HTML) files provides information about the API.
- A frame describes a package and contains hyperlinks to information describing each class in that package.
- A class document includes the class hierarchy, a description of the class, a list of member variables, a list of constructors, and so on.

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Java Technology API Documentation

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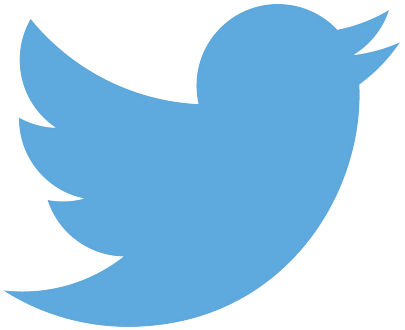

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