Supplementary Slides on Objects and Classes

CS1: Java Programming
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Classes

✦ Classes are the basis of object-oriented (OO) programming.
✦ They encapsulate functionality to form powerful abstractions of real world objects.
✦ What can classes be used for? Classes have many different uses, for example:

- Data Structures
- Code Libraries
- Java Programs
- Complex Objects

Classes as Data Structures

✦ Just like a struct in C and C++ (no code), for example:

```java
public class Student {
    public String firstName;
    public String lastName;
    public Date birthDate;
    public Address homeAddress;
    public double gradePointAverage;
}
```

Classes as Code Libraries

✦ Just like a library in a procedural language (no data) like C or C++, for example:

```java
public class Math {
    public static final double PI = 3.14159;
    public static double sin(double a) {...}
    public static double exp(double a) {...}
    public static double log(double a) {...}
    public static double sqrt(double a) {...}
}
```
Classes as Small Programs

✦ Just like a *program* in a procedural language like C or C++, for example:

```java
public class MySmallProgram{
    public static void main(String args[]) {
        System.out.println("Hello, World!");
    }
}
```

Classes as Large Programs

✦ Just like a *program* in a procedural language like C or C++, for example:

```java
public class MyLargeProgram{
    // lots of data
    public static void main(String args[]) {
        // lots of code
    }
    // lots of methods
}
```

Classes as Complex Objects

✦ No comparable example in a procedural language like C or Pascal!

```java
public class MyClass {
    // class variables (static)
    // instance variables (non-static)
    // no main method
    // class methods (static)
    // instance methods (non-static)
}
```

Using Different Class Types

// Data Structure
Student students[] = new Student[100];
students[0].firstName = "Christopher";
// Code Library
System.out.println(Math.sin(1.0));
// Java Programs
$ java MySmallProgram
// Complex Objects
MyClass myClass = new MyClass();
myClass.initialize();