Northeastern University

Lecture 3: Java Review - 3

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Outline

- Java Interfaces

Java Interfaces

Java Interfaces

- Program component that declares a number of public methods
  - » Should include comments to inform programmer
  - » Any data fields here should be **`public`**, **`static`**, **`final`**

Listing 2-1 Interface `Measurable`

```
/** An interface for methods that return
the perimeter and area of an object.
*/
public interface Measurable
{
   /** Gets the perimeter.
   @return The perimeter. */
   public double getPerimeter ();
   /** Gets the area.
   @return The area. */
   public double getArea ();
} // end Measurable
```

Listing 2-2 Interface `NamedMeasurable`

```
/** An interface for a class of names. */
public interface NameInterface
{
   /** Sets the first and last names.
   @param firstName A string that is the desired first name.
   @param lastName A string that is the desired last name. */
   public void setName (String firstName, String lastName);

   /** Gets the full name.
   @return A string containing the first and last names. */
   public String getName ();
   public void setFirst (String firstName);
   public String getFirst ();
   public void setLast (String lastName);
   public String getLast ();
   public void giveLastNameTo (NameInterface aName);
   public String toString ();
} // end NameInterface
```

Implementing an Interface

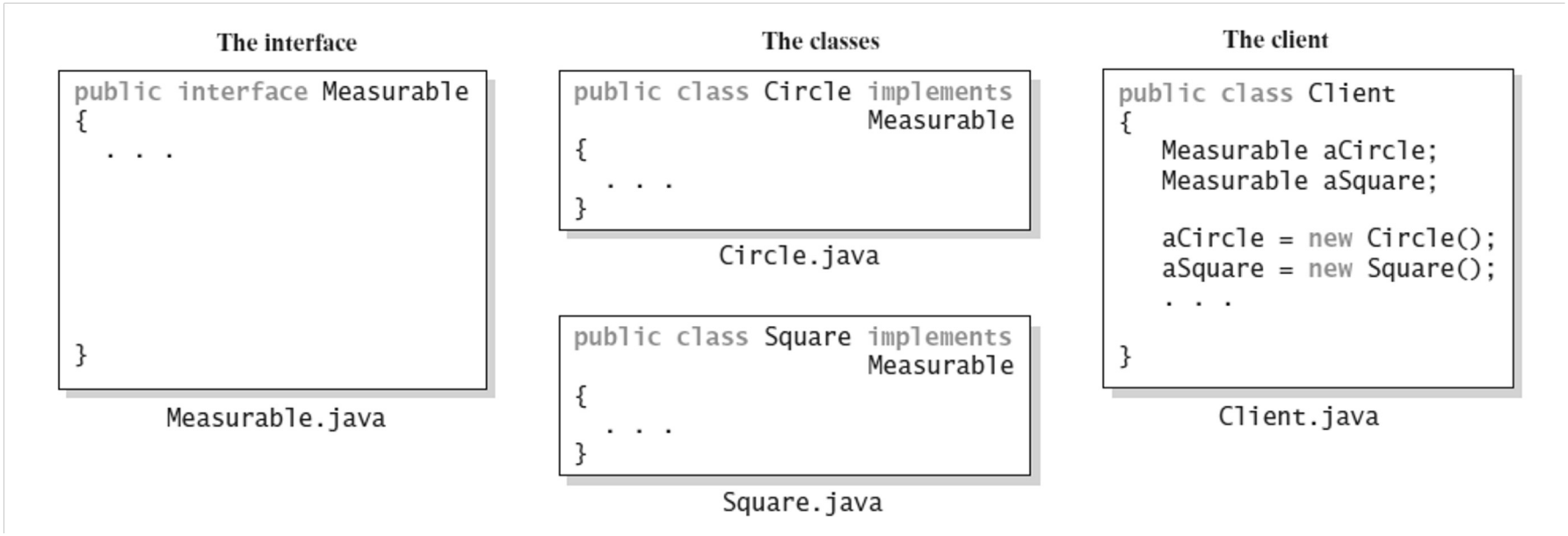


Figure P-3: The files for an interface, a class that implements the interface, and the client

Implementing an Interface

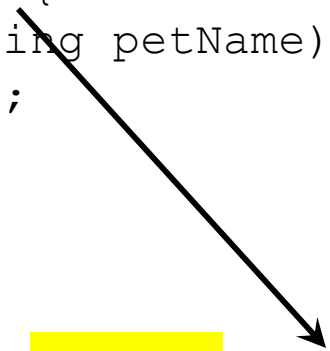
- A way for programmer to guarantee a class has certain methods
- Several classes can implement the same interface
- A class can implement more than one interface

Interface as a Data Type

- You can use a Java interface as a data type
- Indicates variable can invoke certain set of methods and only those methods.
- An interface type is a reference type
- An interface can be used to derive another interface by using inheritance

Interface as a Data Type

```
public interface Nameable {
  public void setName(String petName);
  public String getName();
}
```



```
public interface Callable extends Nameable {
  public void come(String petName);
}
```

Interface vs. Abstract Class

- Purpose of interface similar to that of abstract class
  - » But an interface is *not* a class (or say interface is a special class)
- Use an abstract class …
  - » If you want to provide a method definition
  - » Or declare a private data field that your classes will have in common
- A class can implement several interfaces but can extend only one abstract class.

Interface vs. Abstract Class

- If a class is abstract, you cannot create objects of that class; it can be used only as a base class for other classes.

Exercise

- Write a Java interface (`StudentInterface.java`) that specifies and declares methods for a class of `students`.

Answer

```
public interface StudentInterface {
  public void setStudent(Name studentName, String studentId);
  public void setName(Name studentName);
  public Name getName();
  public void setId(String studentId);
  public String getId();
  public String toString();
}
```

StudentInterface.java

Answer

```
public class Name {
  private String firstName;
  private String lastName;

  public Name(String first, String last){
    firstName = first;
    lastName = last;
  }

  public String toString(){
    return lastName + "," + firstName;
  }
}
```

Name.java

Exercise

- Begin the definition of a class (`Student.java`) that implements the interface that you wrote in answer to the previous question.
- Include data fields, a constructor, and at least one method definition.
- Also, please write a driver program (`StudentTest.java`) to verify your implementation.

Answer

```
public class Student implements StudentInterface{
  private Name fullName;
  private String id;

  public Student(){
    fullName = new Name("","");
    id = "";
  }

  public Student(Name studentName,
                 String studentId){
    fullName = studentName;
    id = studentId;
  }

  public void setStudent(Name studentName,
                         String studentId){
    setName(studentName);
    setId(studentId);
  }

  public void setName(Name studentName){
    fullName = studentName;
  }

  public Name getName(){
    return fullName;
  }

  public void setId(String studentId){
    id = studentId;
  }

  public String getId(){
    return id;
  }

  public String toString(){
    return id + " " + fullName.toString();
  }

} // End of Student class
```

Student.java

Answer

```
public class StudentTest {
  public static void main(String[] args){

    Name student1Name = new Name("Richard", "Anderson");
    String student1Id = "W123456789";

    Student student1 = new Student(student1Name, student1Id);

    System.out.println(student1.getId() + " " + student1.getName());

    // ...
    // You can create another student and use setName() and setId()
  }
}
```

StudentTest.java