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Object Oriented Programming CS F213 Amit Dua

Slides Taken from the slides prepared by Dr. Jennifer

Questions from prev. class

- Can we override the static variables?

Overriding static variable/method

Rule for Overriding static and instance variable & methods.

1) A compilation error occurs if an instance method overrides a static method.
2) A compilation error occurs if a static method hides an instance method.
3) It's permissible for a static variable to hide an instance variable.
4) It's also permissible for an instance variable to hide a static variable.

From last class

```
class A{
static int x = 10;}
class B extends A{
int x = 50;}
public class Main{
public static void main(String[] args) {
A a = new B();
System.out.println("x = "+A.x);
}}
```

```
x = 10
```

Ques from last class

```
interface Printable{
void print();
void show(); }

abstract class trial implements Printable {
public void print() {
System.out.println("Within Print");}
}

public class test extends trial {
//public void show() {
//System.out.println("Within Show");}
public static void main(String[] args) {
test t = new test();
t.print();
t.show();}}
```

error: test is not abstract and does not override abstract method show() in Printable

Ques

```
class Parent{
static int A=50;
static void show() {
System.out.println(A);
}}

class Child extends Parent{
int A=10;
}
class test{
public static void main(String args[]) {
Child c = new Child();
c.show();
System.out.println(c.A);     }
}
```

Output:

```
50
10
```

Warning:
The static method show() from the type Parent should be accessed in a static way

Ques

```
class Parent{
int A=50;
void show() {
System.out.println(A);
}}

class Child extends Parent{
int A=10;
}
class test{
public static void main(String args[]) {
Child c = new Child();
c.show();
System.out.println(c.A);      }
}
```

Output:

```
50
10
```

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Nested Classes

Inner Classes

- Nested classes are used to logically group classes or interfaces in one place, for more readability and maintainability.
- Nested class can access all members of the outer class including the private data members and methods.
- Two types:
- Non-static nested class (inner class)
  - Member
  - Anonymous
  - local
- Static nested class

Member Inner class - Example

```
class Outer{
int data = 30;
private int val = 20;
class Inner{
void show() {
System.out.println("Data=:"+data+"Value="+val);} }
}
class test{
public static void main(String args[]) {
Outer o = new Outer();
Outer.Inner in = o.new Inner();
in.show();
}  }
```

Member Inner Class

- Compiler creates two class files of the inner class
  - Outer.class and Outer$Inner.class

- To instantiate the inner class, the instance of the outer class must be created

- The inner class have a reference to the outer class, thus it can access all the data members of the outer class.

Member Inner class - Example

```
class Outer{
int data = 30;
private int val = 20;
private class Inner{
void show() {
System.out.println("Data=:"+data+"Value="+val);}
}
void print() {
Inner in = new Inner();
in.show();}
}
class test{
public static void main(String args[]) {
Outer o = new Outer();
o.print();}
}
```

Note:
Unlike a class, an inner class can be private.

Anonymous Inner Class

- Class with no name

- Used when a method or interface is to be overridden

Anonymous class - Example

```
abstract class Outer{
int data = 30;
abstract void show();
void print() {
System.out.println("Within Print");
}
}
class test {
public static void main(String args[]) {
Outer o = new Outer() {
void show() {
System.out.println("Data=:"+data);}
};
o.show();
o.print();
}}
```

Anonymous Class

- The name of the class created is decided by the compiler
- In the given example, the anonymous class extends the ‘Outer’ class and gives implementation for the show() method.
- The object of the anonymous class can be referred by the reference variable ‘o’
- Anonymous class cannot have additional methods because it is accessed using the reference to the ‘Outer’ class

Anonymous Inner Class using Interface-Example

```
interface Outer{
int data = 30;
void show();
}
class test {
public static void main(String args[]) {
Outer o = new Outer() {
public void show() {
System.out.println("Data=:"+data);
//data =25;           // Error
}
};
o.show();
}
}
```

Local Inner Class-Example

```
class Outer{
private int data = 30;
void show() {
int val =50;
class inner{
void print() {
System.out.println("Value= "+val+"Data="+data);}}
inner i =new inner();      // Creating a named type
i.print(); }
}
class test {
public static void main(String args[]) {
Outer o = new Outer();
o.show();
//o.print();  //Error}
}
```

Note:
Local inner class can be instantiated only within the method it is defined.

Static Nested Class-Example

```
class Outer{
static int data = 30;
private static int val = 20;
static class Inner{
void show() {
System.out.println("Data=:"+data+"Value="+val);
}
}
}
class test{
public static void main(String args[]) {
Outer.Inner in = new Outer.Inner();
in.show();
}
}
```

Static Inner Class

- A static class created inside a class.
- It can access the static data members of the outer class including the private members.
- It cannot access the non-static members and methods.
- The object of the outer class need not be created, because static methods or classes can be accessed without object.
- **Note:** Only inner classes can be prefixed with the static keyword.

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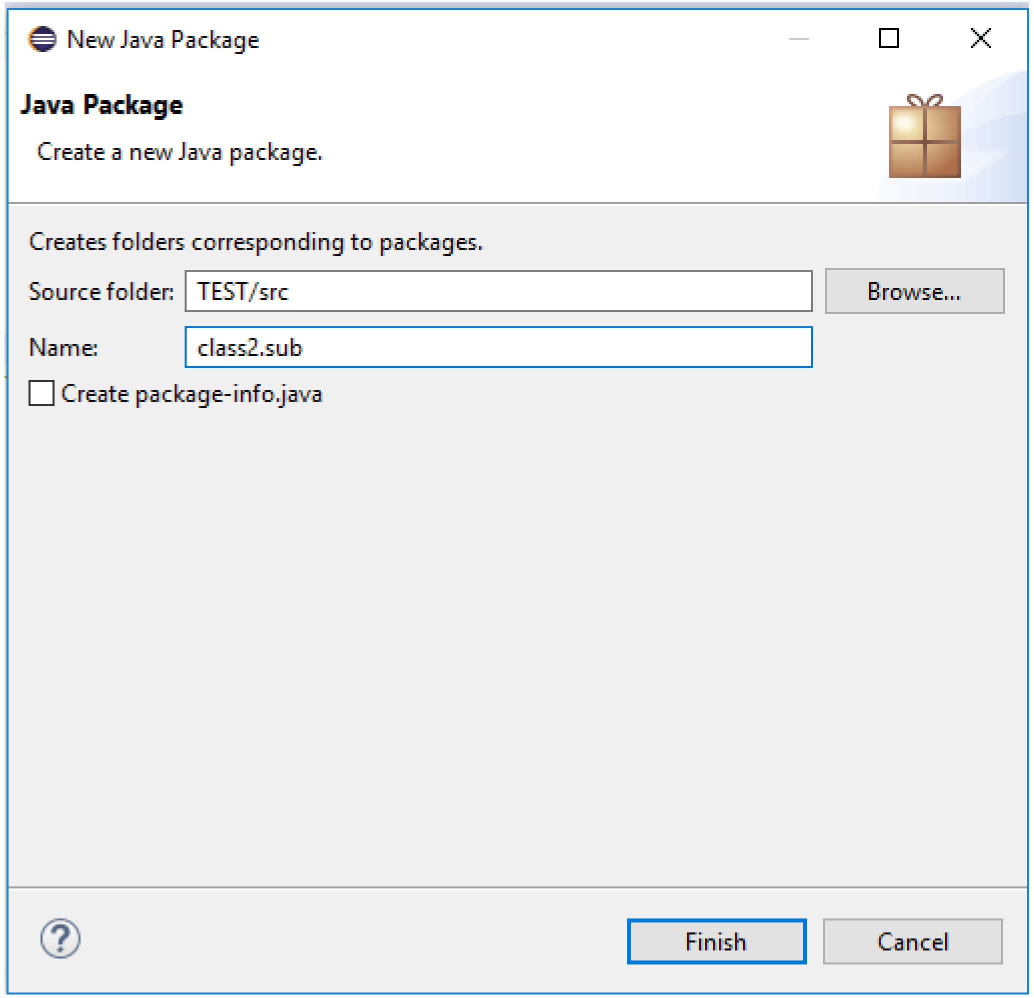
Packages

Create a package & sub package

Project → New → Package



Java Package

Create a new Java package.

Creates folders corresponding to packages.

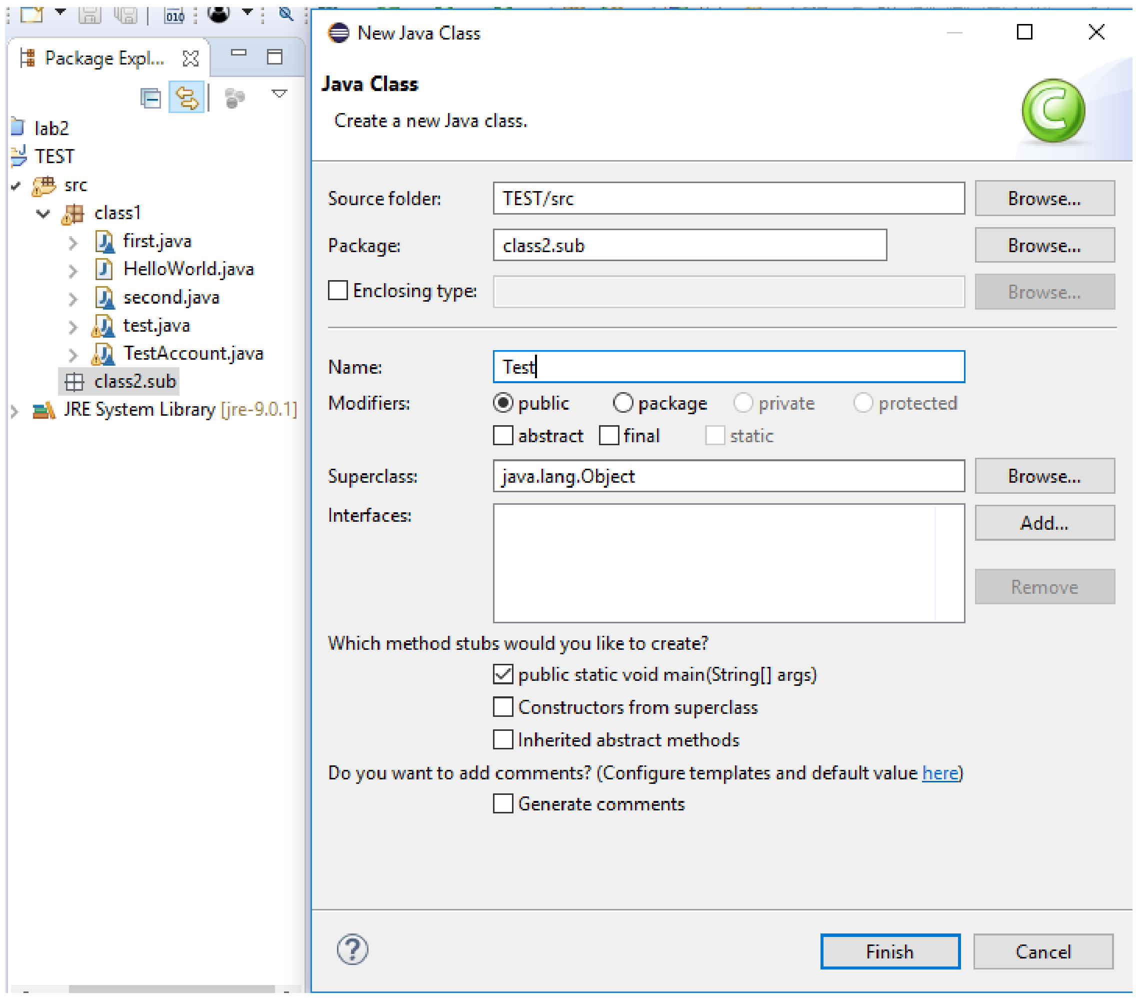
Source folder: TEST/src

Name: class2.sub

☐ Create package-info.java

Create a class within the package

Package → New → class


Package Explorer

lab2
TEST
src
class1
first.java
HelloWorld.java
second.java
test.java
TestAccount.java
class2.sub
JRE System Library [jre-9.0.1]

New Java Class

Java Class

Create a new Java class.

Source folder: TEST/src
Package: class2.sub
Enclosing type: [ ]
Name: Test
Modifiers: [✓ public] package private protected
[ ] abstract [ ] final [ ] static
Superclass: java.lang.Object
Interfaces:

Which method stubs would you like to create?
[✓] public static void main(String[] args)
[ ] Constructors from superclass
[ ] Inherited abstract methods

Do you want to add comments? (Configure templates and default value here)
[ ] Generate comments

Class within the package

```
package class2.sub;

public class Test {

public static void main(String[] args) {
// TODO Auto-generated method stub

}

}
```

Importing a package

```
package class1;

public class HelloWorld
{
 public void show() {
  System.out.println("Within class
    1's show");
  }
}
```

```
package class2.sub;
import class1.*;

public class Test {

public static void main(String[]
     args) {
HelloWorld h = new HelloWorld();
h.show();

}


}
```

Importing a class

```java
package class1;

public class HelloWorld
{
 public void show() {
  System.out.println("Within class 1's show");
  }
}
```

```java
package class2.sub;
import class1.HelloWorld;

public class Test {
public static void main(String[] args) {
HelloWorld h = new HelloWorld();
h.show();
}
}
```

Access Modifiers

Access Modifier	within class	within package	outside package by subclass only	outside package
Private	Y	N	N	N
Default	Y	Y	N	N
Protected	Y	Y	Y	N
Public	Y	Y	Y	Y

Ques

```
interface Printable{
void show();
}

interface Showable{
int show();
}

class trial implements Printable,Showable{
public int show() {
System.out.println("Within Show");
}
}
```

Error:
show in showable not overriden and trial is not abstract

Ques

```
interface Printable{
static void show() {
System.out.println("Within Static
    Show");
};
}

interface Showable{
default void show()
{
System.out.println("Within default
    Show");
};
}
```

```
class trial implements
    Printable,Showable{
}
class test{
public static void main(String
    args[]) {
trial t = new trial();
t.show();
}
}
```

Output:
Within default Show

Ques

```
interface Printable{
static void show() {
System.out.println("Within Static
    Show");
};
}

interface Showable{
default void show()
{
System.out.println("Within default
    Show");
};
}
```

```
class trial implements
    Printable,Showable{
public void show() {
System.out.println("Within Show");
Showable.super.show();
Printable.show();
} }
class test{
public static void main(String
    args[]) {
trial t = new trial();
t.show();
}
}
```

Output:

```
Within Show
Within default Show
Within Static Show
```

Ques

```
interface Printable{
int data=20;
class Showable{
void show()
{
System.out.println("Interface Variable "+data);
}
}
}
class test extends Printable.Showable{
public static void main(String args[]) {
test c = new test();
c.show();
}}
```

Output:

```
Interface Variable 20
```