

D:\Demonstration\Demonstration-VII\Demonstration_71\Demonstration_71.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_71.java

```
1  /* Example-1 of default access modifier */
2
3 //Save the following classes in the same file named as Demonstration_71.java
4
5 class A {
6     void msg(){System.out.println("Hi! I am in Class A");}
7 }
8
9
10 class Demonstration_71 {
11     public static void main(String args[]){
12         A obj = new A();
13         obj.msg();
14     }
15 }
16
```

Java source file length : 397 lines : 16 Ln : 1 Col : 1 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_71

Command Prompt



D:\Demonstration\Demonstration-VII\Demonstration_71\Demonstration_71.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window

Demonstration_71.java

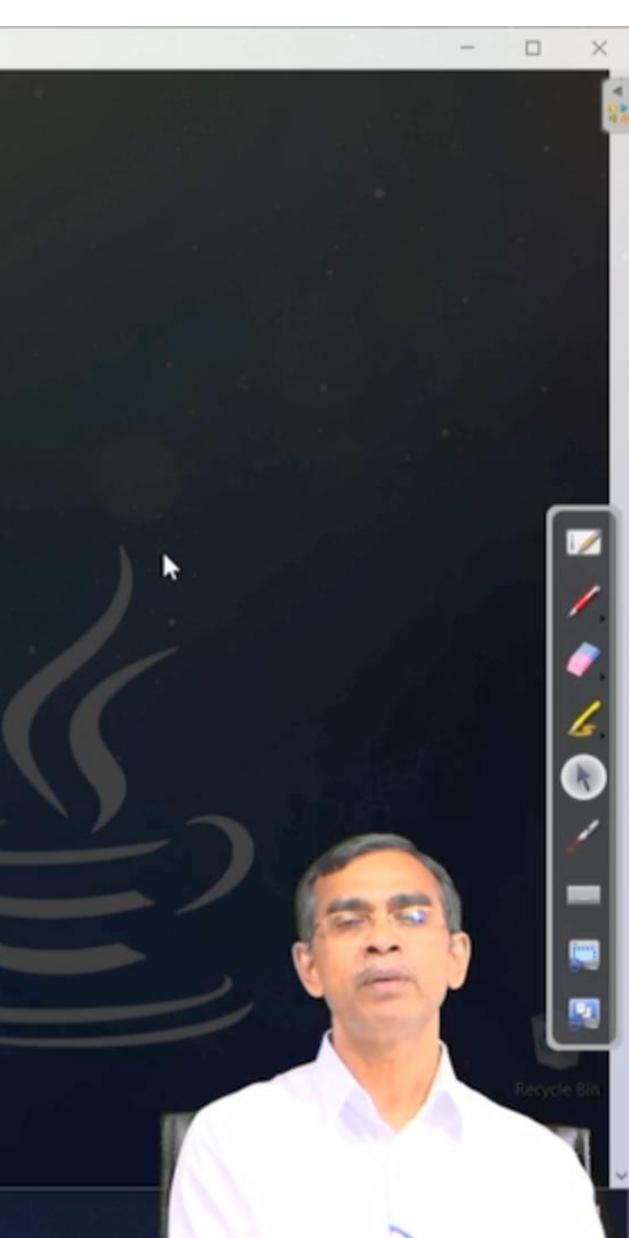
```
1  /* Example-1 of default access modifier */
2
3 //Save the following classes in the same file named as Demonstration_71.java
4
5 class A {
6     void msg(){System.out.println("Hi! I am in Class A");}
7 }
8
9
10 class Demonstration_71 {
11     public static void main(String args[]){
12         A obj = new A();
13         obj.msg();
14     }
15 }
16
```

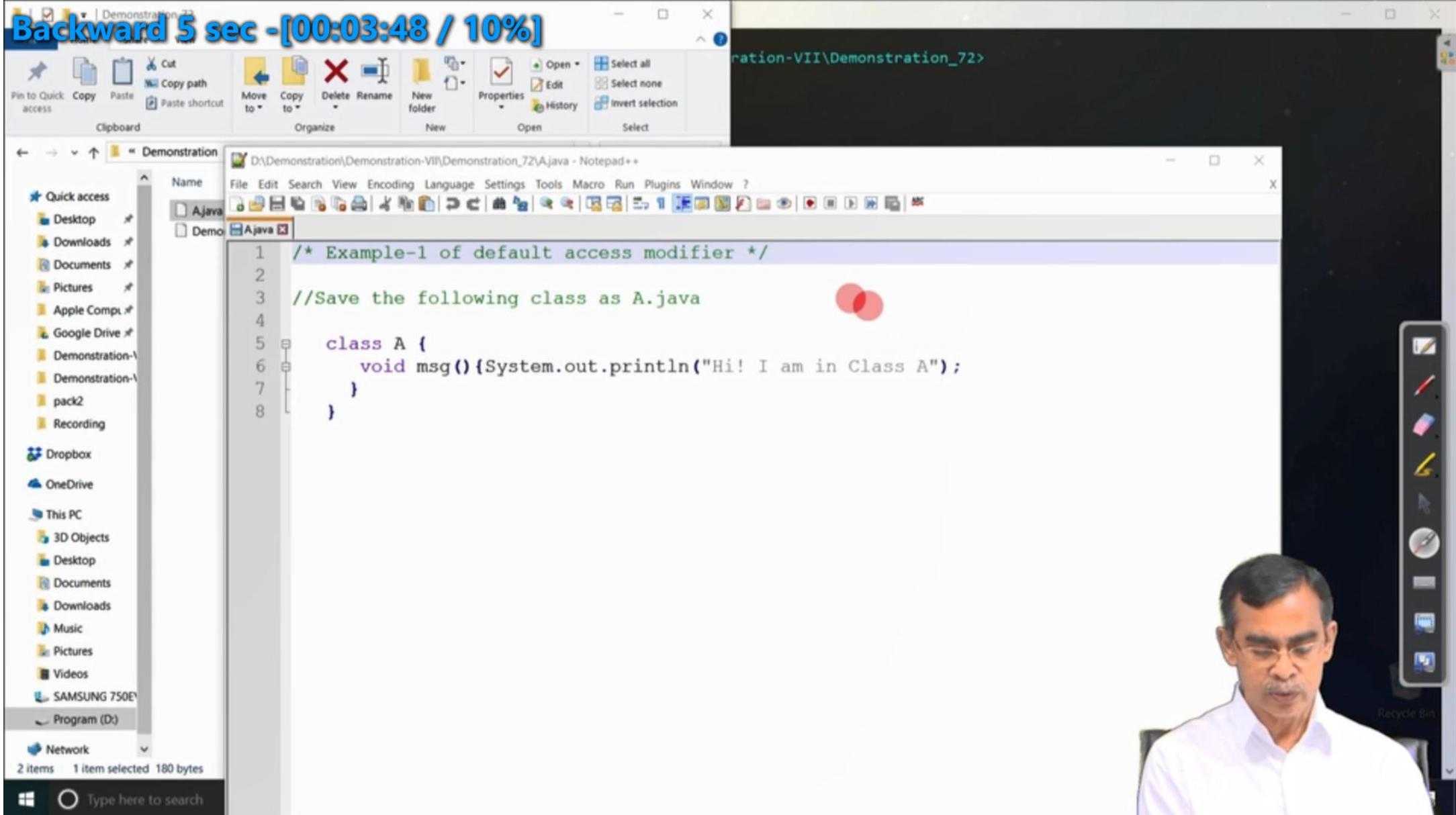
length : 397 lines : 16 Ln : 1 Col : 1 Sel : 0 | 0 Windows (CRLF) UTF-8 INS

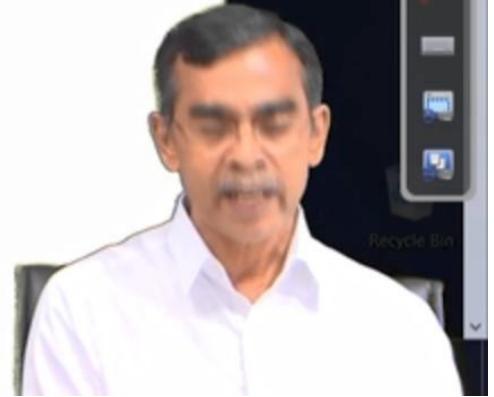
Type here to search

Command Prompt

D:\Demonstration\Demonstration-VII\Demonstration_71>







Demonstration_72

File Home Share View

Pin to Quick access Copy Paste Move to... Copy to... Delete Rename New folder Properties Open Select all Select none Select none Invert selection Select

Clipboard

← → ↑ ↓ Demonstration

Quick access

- Desktop
- Downloads
- Documents
- Pictures
- Apple Computer
- Google Drive
- Demonstration-1
- Demonstration-2
- pack2
- Recording

Dropbox

OneDrive

This PC

- 3D Objects
- Desktop
- Documents
- Downloads
- Music
- Pictures
- Videos

SAMSUNG 750E

Program (D:)

Network

2 items

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_72\Demonstration_72.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

D:\Java\Demonstration_72.java

```
1  /* Example-1 of default access modifier */
2
3  //Save the following classes in the same file named as Demonstration_72.java
4
5  class Demonstration_72 {
6      public static void main(String args[]){
7          A obj = new A();
8          obj.msg();
9      }
10 }
11 }
```

KMPlayer

Lecture 16 _ Demonstration-VII.mp4

File Home Share View

Pin to Quick access Cut Copy path Move to " Copy Paste Paste shortcut Copy to " Delete Rename New folder Properties Open Select all Select none Invert selection

Clipboard Organize New Open Select

← → ↑ ↓ Demonstration > Demonstration-VII > Demonstration_73 > Directory 1 Search Directory... ?

Name Date modified Type Size

Aclass 17-Nov-18 6:39 PM CLASS File 1 KB

Ajava 17-Nov-18 6:39 PM JAVA File 1 KB

Quick access

- Desktop
- Downloads
- Documents
- Pictures
- Apple Computer
- Google Drive
- Demonstration-VII
- Demonstration_73
- pack2
- Recording

Dropbox

OneDrive

This PC

- 3D Objects
- Desktop
- Documents
- Downloads
- Music
- Pictures
- Videos

SAMSUNG 750E

Program (D:)

Network

D:\Demonstration\Demonstration-VII\Demonstration_73>javac A.java

D:\Demonstration\Demonstration-VII\Demonstration_73>javac Demonstration_72.java

D:\Demonstration\Demonstration-VII\Demonstration_72>java Demonstration_72

Hi! I am in Class A

D:\Demonstration\Demonstration-VII\Demonstration_72>

00:05:30 00:37:17



A screenshot of a Windows desktop environment showing a file explorer window, a command prompt window, and a Notepad++ window.

The file explorer window (left) shows the path: Demonstration > Demonstration-VII > Demonstration_73 > Directory 2. It contains one item: Demonstration_73.java (1 KB). The command prompt window (top right) shows the following output:

```
D:\Demonstration\Demonstration-VII\Demonstration_72>javac A.java
D:\Demonstration\Demonstration-VII\Demonstration_72>javac Demonstration_72.java
a
D:\Demonstration\Demonstration-VII\Demonstration_72>java Demonstration_72
Hi! I am in Class A
D:\Demonstration\Demonstration-VII\Demonstration_72>
```

The Notepad++ window (bottom center) displays the Java code for Demonstration_73.java:

```
/* Example-1 of default access modifier */
//Save the following class as Demonstration_73.java
class Demonstration_73 {
    public static void main(String args[]){
        A obj = new A();
        obj.msg();
    }
}
```

A screenshot of a Windows desktop environment showing a File Explorer window and a Command Prompt window.

File Explorer (Left):

- Path: Demonstration > Demonstration-VII > Demonstration_73 > Directory 2
- Selected item: Demonstration_73.java
- Details: Date modified: 17-Nov-18 6:48 PM, Type: JAVA File, Size: 1 KB
- Quick access sidebar:

 - Desktop, Downloads, Documents, Pictures, Apple Computer, Google Drive, Demonstration-1, Demonstration-2, pack2, Recording
 - Dropbox, OneDrive, This PC, 3D Objects, Desktop, Documents, Downloads, Music, Pictures, Videos, SAMSUNG 750E
 - Program (D:)
 - Network

1 item 1 item selected 275 bytes

Type here to search

Command Prompt (Right):

```
D:\Demonstration\Demonstration-VII\Demonstration_72>cd D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2
D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>javac Demonstration_73.java
Demonstration_73.java:7: error: cannot find symbol
    A obj = new A();
          ^
symbol:   class A
location: class Demonstration_73
Demonstration_73.java:7: error: cannot find symbol
    A obj = new A();
          ^
symbol:   class A
location: class Demonstration_73
2 errors

D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>
ion_73.java

args[]){
```



D:\Demonstration\Demonstration-VII\Demonstration_72>cd D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2

D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>javac Demonstration_73.java

```
Demonstration_73.java:7: error: cannot find symbol
    A obj = new A();
           ^
symbol:   class A
location: class Demonstration_73
Demonstration_73.java:7: error: cannot find symbol
    A obj = new A();
           ^
symbol:   class A
location: class Demonstration_73
2 errors
```

D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>

ion_73.java

args[]){

Type here to search

This screenshot shows a Windows desktop environment with two open windows. On the left is a File Explorer window showing a directory structure under 'pack1' in 'Demonstration_74'. It contains two files: 'Aclass' (CLASS File) and 'Ajava' (JAVA File). Both were modified on 17-Nov-18 at 6:50 PM. The right window is a Command Prompt showing the output of a Java compilation command. The command 'javac Demonstration_73.java' was run, but it failed due to a 'cannot find symbol' error for the class 'A'. The error message points to line 7 of 'Demonstration_73.java'. The Java code in 'Ajava' is partially visible, showing the declaration of an object 'obj' of type 'A'. The Java compiler also outputs '2 errors'. The background of the desktop features a portrait of a man with glasses and a white shirt.

Backward 5 sec - [00:08:11 / 21%]

D:\Demonstration\Demonstration-VII\Demonstration_72>cd D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2

D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>javac Demonstration_73.java

Demonstration_73.java:7: error: cannot find symbol
 A obj = new A();
 ^
 symbol: class A
 location: class Demonstration_73

Demonstration_73.java:7: error: cannot find symbol
 A obj = new A();
 ^
 symbol: class A
 location: class Demonstration_73

D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1\A.java - Notepad++

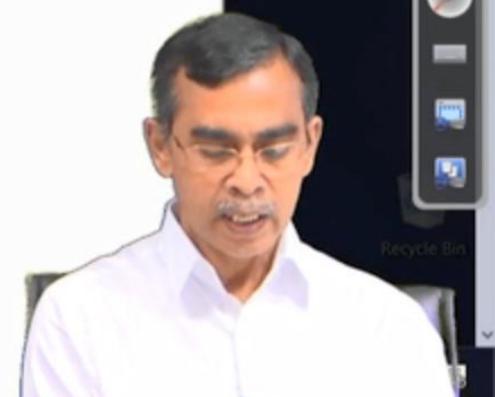
A Java

```
1  /* Example-1 of default access modifier */  
2  
3 //Save the following class as A.java  
4 package pack1;  
5  
6 public class A {  
7     void msg(){System.out.println("Hi! I am in Class A");  
8 }  
9 }
```

2 items 1 item selected 201 bytes

Type here to search





A screenshot of a Windows desktop environment showing a file explorer window, a command prompt window, and a Notepad++ window.

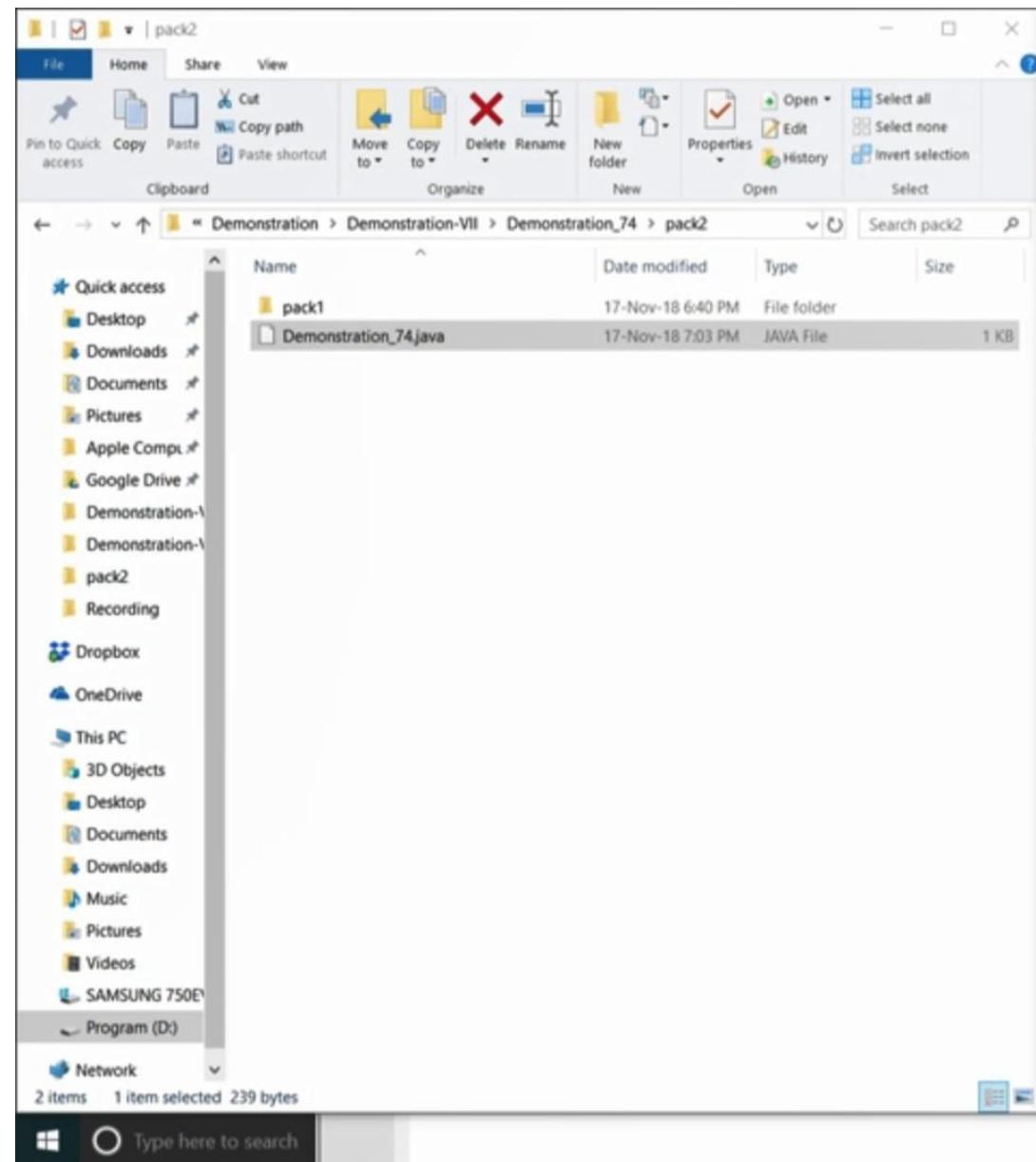
The file explorer window (top left) shows the path: Demonstration > Demonstration-VII > Demonstration_74 > pack2. It lists a folder "pack1" and a Java file "Demonstration_74.java".

The command prompt window (top right) shows the following output:

```
D:\Demonstration\Demonstration-VII>Demonstration_72>cd D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2
D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>javac Demonstration_73.java
Demonstration_73.java:7: error: cannot find symbol
        A obj = new A();
               ^
symbol:   class A
location: class Demonstration_73
Demonstration_73.java:7: error: cannot find symbol
        A obj = new A();
               ^
symbol:   class A
location: class Demonstration_73
```

The Notepad++ window (bottom center) displays the content of "Demonstration_74.java":

```
1  /* Example-1 of default access modifier */
2
3  import pack1.*;
4
5  class Demonstration_74 {
6      public static void main(String args[]){
7          A obj = new A();
8          obj.msg();
9      }
10 }
11
```



A screenshot of the Windows Command Prompt window titled 'Command Prompt - javac Demonstration_74.java'. The command entered is 'javac Demonstration_74.java'. The output shows the command being run and the path to the Java file. The background of the Command Prompt window features a video of a man with glasses and a mustache speaking. The Command Prompt interface includes a toolbar with icons for Run, Task Manager, File Explorer, and Task View.

```
D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>cd D:\Demonstration\Demonstration-VII\Demonstration_74\pack2
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>javac Demonstration_74.java
```



A screenshot of a Windows desktop showing a file explorer window, a command prompt window, and a Notepad++ window.

The file explorer window shows a folder structure under "D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1". It contains two files: "Aclass" (CLASS File, 1 KB) and "Ajava" (JAVA File, 1 KB). The "Ajava" file is selected.

The command prompt window shows the following output:

```
D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>cd D:\Demonstration\Demonstration-VII\Demonstration_74\pack2
D:\Demonstration\Demonstration-VII\Demonstration_74>javac Demonstration_74.java
Demonstration_74.java:8: error: msg() is not public in A; cannot be accessed from outside package
        obj.msg();
               ^
1 error
```

The Notepad++ window displays the Java code for "A.java":

```
/* Example-1 of default access modifier */
//Save the following class as A.java
package pack1;

public class A {
    void msg(){System.out.println("Hi! I am in Class A");}
}
```



A screenshot of a Windows desktop showing a file explorer window, a command prompt window, and a Notepad++ window.

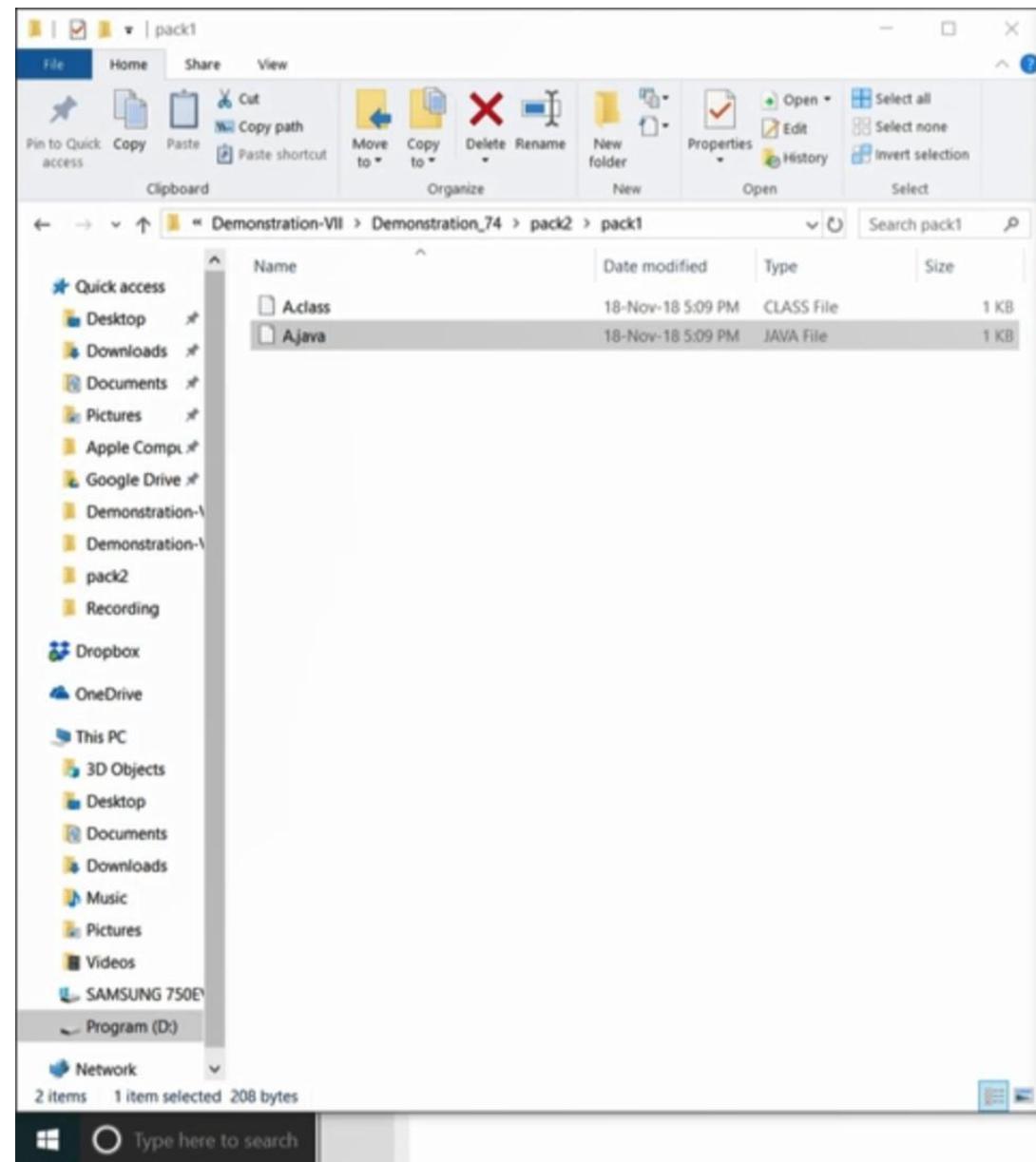
The file explorer window shows a folder structure under "D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1". It contains two files: "Aclass" (CLASS File, 1 KB) and "Ajava" (JAVA File, 1 KB). The "Ajava" file is selected.

The command prompt window shows the following output:

```
D:\Demonstration\Demonstration-VII\Demonstration_73\Directory 2>cd D:\Demonstration\Demonstration-VII\Demonstration_74\pack2
D:\Demonstration\Demonstration-VII\Demonstration_74>javac Demonstration_74.java
Demonstration_74.java:8: error: msg() is not public in A; cannot be accessed from outside package
        obj.msg();
               ^
1 error
```

The Notepad++ window displays the Java code for "A.java":

```
1  /* Example-1 of default access modifier */
2
3  //Save the following class as A.java
4  package pack1;
5
6  public class A {
7      public void msg(){System.out.println("Hi! I am in Class A");}
8  }
9 }
```



A screenshot of a Command Prompt window titled 'Command Prompt'. The window shows the following text:
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1>javac A.java
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1>cd..
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>javac Demonstration_74.java
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>java Demonstration_74
Hi! I am in Class A
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>
The background of the desktop shows a man's face.



A screenshot of a Windows desktop showing a file explorer window, a command prompt window, and a Notepad++ window.

The file explorer window shows a folder structure under "Demonstration-VII > Demonstration_74 > pack2 > pack1". Inside "pack1", there are two files: "Aclass" (CLASS File, 1 KB) and "Ajava" (JAVA File, 1 KB).

The command prompt window shows the following output:

```
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1>javac A.java
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2\pack1>cd..
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>javac Demonstration_74.java
D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>java Demonstration_74
4
Hi! I am in Class A
```

The Notepad++ window displays Java code:

```
/* Example-1 of default access modifier */
import pack1.*;

class Demonstration_74 {
    public static void main(String args[]){
        A obj = new A();
        obj.msg();
    }
}
```

D:\Demonstration\Demonstration-VII\Demonstration_75\Demonstration_75.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_75.java

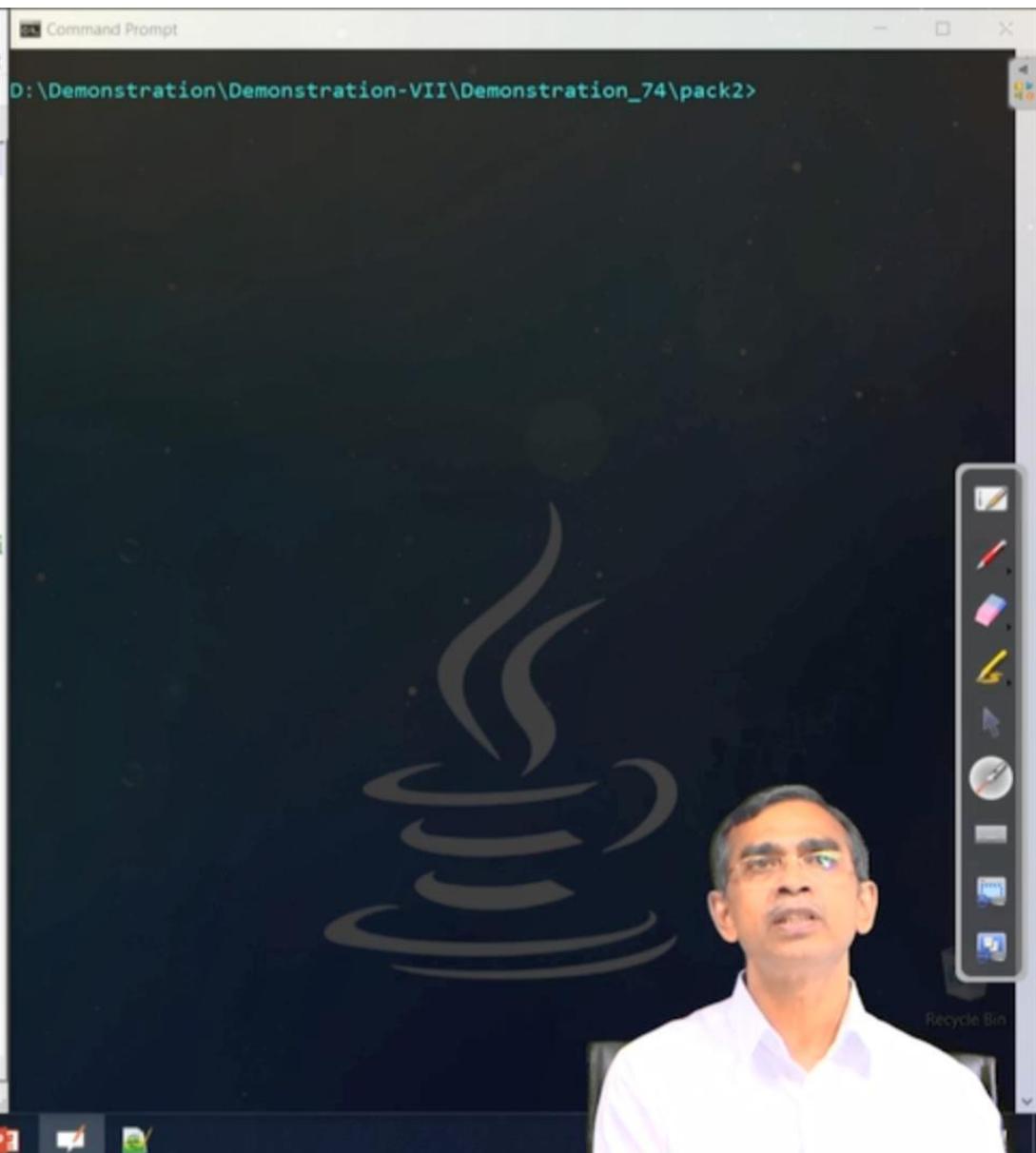
```
1  /* Example-1 of public access modifier */
2
3  class A{
4      public int data=40;
5      public void msg(){
6          System.out.println("Class A: Hello Java!");
7      }
8  }
9
10 public class Demonstration_75 {
11     public static void main(String args[]){
12         A obj = new A(); //OK : Class A is public
13         System.out.println(obj.data); //OK : data is public
14         obj.msg(); //OK: msg is public
15     }
16 }
17
```

Java : length : 370 lines : 17 Ln : 1 Col : 1 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search

Command Prompt

D:\Demonstration\Demonstration-VII\Demonstration_74\pack2>



The video player interface shows a man in a white shirt speaking. In the background, there is a large Java logo (a steaming coffee cup). The video player has a dark theme with various icons on the right side.

Demonstration_75

File Home Share View

Pin to Quick access Copy Paste Copy path Move to Copy Delete Rename New Properties

Clipboard

Organize

← → ↑ ↓ Demonstration > Demonstration-VII > Dem

Name

- Quick access
- Desktop
- Downloads
- Documents
- Pictures
- Apple Computer
- Google Drive
- Demonstration-1
- Demonstration-1
- pack2
- Recording

Dropbox

OneDrive

This PC

3D Objects

Desktop

Documents

Downloads

Music

Pictures

Videos

SAMSUNG 750E

Program (D:)

Network

4 items 1 item selected 370 bytes

Type here to search

Java SOURCE file

length: 370 lines: 17 E:1 Edt:1 Sel:0/0

Command Prompt

D:\Demonstration\Demonstration-VII\Demonstration_75\Demonstration_75.java : Notepad++

Demonstration_75.java

```
/* Example-1 of public access modifier */
class A{
    public int data=10;
    public void msg(){
        System.out.println("Class A: Hello Java!");
    }
}
public class Demonstration_75 {
    public static void main(String args[]){
        A obj = new A(); //OK : Class A is public
        System.out.println(obj.data); //OK : data is public
        obj.msg(); //OK: msg is public
    }
}
```





Demonstration_75

File Home Share View

Cut Copy Paste Copy path Move to Copy to Delete Rename New folder Properties Open Select all Select none History Invert selection Select

Clipboard

Organize New

Pin to Quick access

Quick access

Desktop Downloads Documents Pictures Apple Computer Google Drive Demonstration-VII Demonstration-VIII pack2 Recording Dropbox OneDrive This PC 3D Objects Desktop Documents Downloads Music Pictures Videos SAMSUNG 750E Program (D:) Network

Name Date modified Type Size

Aclass 18-Nov-18 5:11 PM CLASS File 1 KB

Ajava 17-Nov-18 7:45 PM JAVA File 1 KB

Demonstration_75.class 18-Nov-18 5:11 PM CLASS File 1 KB

Demonstration_75.java 18-Nov-18 5:12 PM JAVA File 1 KB

D:\Demonstration\Demonstration-VII\Demonstration_75\Demonstration_75.java - Notepad

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Windows

Demonstration_75.java

```
1 /* Example-1 of public access modifier */
2
3 class A{
4     public int data=40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!");
7     }
8 }
9
10 public class Demonstration_75 {
11     public static void main(String args[]){
12         A obj = new A(); //OK : Class A is public
13         System.out.println(obj.data); //OK : data is public
14         obj.msg(); //OK: msg is public
15     }
16 }
17 }
```

D:\Demonstration\Demonstration-VII\Demonstration_75>javac Demonstration_75.java

a

Demonstration_75.java:3: error: class A is public, should be declared in a file named A.java

public class A{
 ^

1 error

D:\Demonstration\Demonstration-VII\Demonstration_75>cl



Demonstration_75

File Home Share View

Pin to Quick access Copy Paste Copy path Move to Copy to Delete Rename New folder Properties Open Select all Select none Invert selection Open Select

Clipboard

Organize New

Name Date modified Type Size

Aclass 18-Nov-18 5:12 PM CLASS File 1 KB

Ajava 17-Nov-18 7:45 PM JAVA File 1 KB

Demonstration_75.class 18-Nov-18 5:12 PM CLASS File 1 KB

Demonstration_75.java 18-Nov-18 5:12 PM JAVA File 1 KB

Command Prompt

```
D:\Demonstration\Demonstration-VII\Demonstration_75>javac Demonstration_75.java
D:\Demonstration\Demonstration-VII\Demonstration_75>
```

D:\Demonstration\Demonstration-VII\Demonstration_75\Demonstration_75.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_75.java

```
/* Example-1 of public access modifier */
class A{
    public int data=40;
    public void msg(){
        System.out.println("Class A: Hello Java!");
    }
}

public class Demonstration_75 {
    public static void main(String args[]){
        A obj = new A(); //OK : Class A is public
        System.out.println(obj.data); //OK : data is public
        obj.msg(); //OK: msg is public
    }
}
```

Backward.5 sec [100:13:58 / 37%]

```
1  /* Example-1 : Private access modifier */
2
3  class A{
4      private int data = 40;
5      public void msg(){
6          System.out.println("Class A: Hello Java!");
7      }
8  }
9
10 public class Demonstration_77 {
11     public static void main(String args[]){
12         A obj = new A();           //OK : Class A is pu
13         System.out.println(obj.data); //Compile Time Error
14         obj.msg();                //OK : msg is public
15     }
16 }
17
```

Command Prompt

```
D:\Demonstration\Demonstration-VII>Demonstration_77>javac Demonstration_77.java
a
```



D:\Demonstration\Demonstration-VII\Demonstration_77\Demonstration_77.java - Notepad++

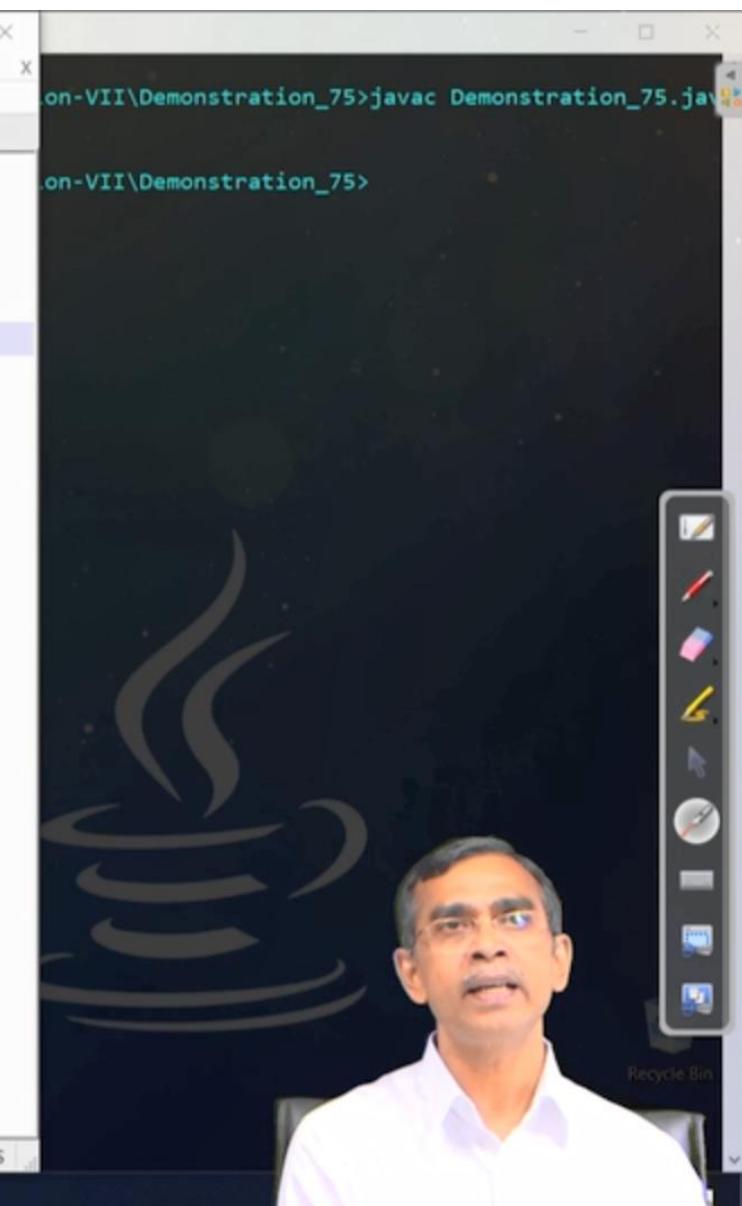
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_77.java

```
1 /* Example-1 : Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!");
7     }
8 }
9
10 public class Demonstration_77 {
11     public static void main(String args[]){
12         A obj = new A(); //OK : Class A is public
13         System.out.println(obj.data); //Compile Time Error : data is private
14         obj.msg(); //OK : msg is public
15     }
16 }
17
```

on-VII\Demonstration_75>javac Demonstration_75.java

on-VII\Demonstration_75>



Java source file length : 423 lines : 17 Ln:6 Col:15 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

Backward 5 sec - [00:15:30 / 41%]

D:\Demonstration\Demonstration-VII\Demonstration_77>javac Demonstration_77.java

a

Demonstration_77.java:13: error: data has private access in A
System.out.println(obj.data); //Compile Time Error : data is p

rivate

1 error

D:\Demonstration\Demonstration-VII\Demonstration_77>

public
: data is private

Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_78\Demonstration_78.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_78.java

```
1 /* Example-2: Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!" + data);
7     }
8 }
9
10 public class Demonstration_78 {
11     public static void main(String args[]){
12         //private int data2 = 100;
13         //public int data2 = 100;
14         int data2 = 100;
15         A obj = new A(); //OK : Class A is public
16         System.out.println("Class B:"+ data2); //OK: private data in the same class
17         obj.msg(); // Private data is accessible through public method
18     }
19 }
20
```

Java source file

length: 515 lines: 20 Ln:1 Col:1 Sel:0 | 0

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_78\Demonstration_78.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_78.java

```
1 /* Example-2: Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!" + data);
7     }
8 }
9
10 public class Demonstration_78 {
11     public static void main(String args[]){
12         //private int data2 = 100;
13         //public int data2 = 100;
14         int data2 = 100;
15         A obj = new A(); //OK : Class A is public
16         System.out.println("Class B:"+ data2); //OK: private data in the same class
17         obj.msg(); // Private data is accessible through public method
18     }
19 }
20
```

Java source file

length : 515 lines : 20 Ln : 1 Col : 1 Sel : 0 | 0

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_78\Demonstration_78.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_78.java

```
1 /* Example-2: Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!" + data);
7     }
8 }
9
10 public class Demonstration_78 {
11     public static void main(String args[]){
12         //private int data2 = 100;
13         //public int data2 = 100;
14         int data2 = 100;
15         A obj = new A(); //OK : Class A is public
16         System.out.println("Class B:"+ data2); //OK: private data in the same class
17         obj.msg(); // Private data is accessible through public method
18     }
19 }
20
```

Java source file

length : 515 lines : 20 Ln : 1 Col : 1 Sel : 0 | 0

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_78\Demonstration_78.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_78.java

```
1 /* Example-2: Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!" + data);
7     }
8 }
9
10 public class Demonstration_78 {
11     public static void main(String args[]){
12         //private int data2 = 100;
13         //public int data2 = 100;
14         int data2 = 100;
15         A obj = new A(); //OK : Class A is public
16         System.out.println("Class B:"+ data2); //OK: private data in the same class
17         obj.msg(); // Private data is accessible through public method
18     }
19 }
20
```

Command Prompt

```
D:\Demonstration\Demonstration-VII\Demonstration_78>javac Demonstration_78.java
D:\Demonstration\Demonstration-VII\Demonstration_78>java Demonstration_78
Class B:100
Class A: Hello Java!40
D:\Demonstration\Demonstration-VII\Demonstration_78>
```



Java source file

Type here to search



length:515 lines:20

ln:12 Col:11 Sel:010

D:\Demonstration\Demonstration-VII\Demonstration_78\Demonstration_78.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_78.java

```
1 /* Example-2: Private access modifier */
2
3 class A{
4     private int data = 40;
5     public void msg(){
6         System.out.println("Class A: Hello Java!" + data);
7     }
8 }
9
10 public class Demonstration_78 {
11     public static void main(String args[]){
12         //private int data2 = 100;
13         public int data2 = 100;
14         //int data2 = 100;
15         A obj = new A(); //OK : Class A is public
16         System.out.println("Class B:"+ data2); //OK: private data in the same class
17         obj.msg(); // Private data is accessible through public method
18     }
19 }
20
```

Java source file

Type here to search

length: 515 lines: 20 Ln:13 Col:9 Sel:0|0

Command Prompt

```
D:\Demonstration\Demonstration-VII\Demonstration_78>javac Demonstration_78.java
Demonstration_78.java:13: error: illegal start of expression
                                public int data2 = 100;
                                         ^
1 error
D:\Demonstration\Demonstration-VII\Demonstration_78>
```



D:\Demonstration\Demonstration-VII\Demonstration_79\Demonstration_79.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_79.java

```
1 class A{
2     private A(){
3         /*private constructor
4     }
5
6     void msg(){
7         System.out.println("Class A: Hello Java!");
8     }
9
10
11 public class Demonstration_79 {
12     public static void main(String args[]){
13         A obj = new A(); //Compile Time Error
14     }
15 }
16
```

Java source file length : 248 lines : 16 Ln : 1 Col : 1 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search

Command Prompt

D:\Demonstration\Demonstration-VII\Demonstration_79>



The image shows a screenshot of a Windows desktop with two open windows. On the left is a Notepad++ window displaying Java code. The code defines a class A with a private constructor and a msg() method that prints "Class A: Hello Java!". It also contains a main() method for a Demonstration_79 class that creates an A object. A note in the code states "//Compile Time Error". On the right is a Command Prompt window showing the path D:\Demonstration\Demonstration-VII\Demonstration_79>. In the bottom right corner of the screen, there is a video overlay of a man with glasses and a white shirt, likely a lecturer, standing in front of a large Java logo.

Backward.5 sec [00:22:28 / 60%]

```
1 class A{
2     private A(){
3         println("Constructor")
4     }
5     public void msg(){
6         System.out.println("Class A: Hello Java!");
7     }
8 }
9
10 public class Demonstration_79 {
11     public static void main(String args[]){
12         A obj = new A(); //Compile Time Error
13     }
14 }
15
16
```

```
D:\Demonstration\Demonstration-VII\Demonstration_79>javac Demonstration_79.java
```

```
D:\Demonstration\Demonstration-VII\Demonstration_79>java Demonstration_79
```

```
D:\Demonstration\Demonstration-VII\Demonstration_79>
```



Java source file

length : 247 lines : 16

Ln : 2 Col : 11 Sel : 0 | 0

Windows (CR LF)

UTF-8

INS

Type here to search



Forward 5 sec -[00:22:52 / 61%]

D:\Demonstration\Demonstration-VII\Demonstration_710\Demonstration_710.java - NetBeans IDE

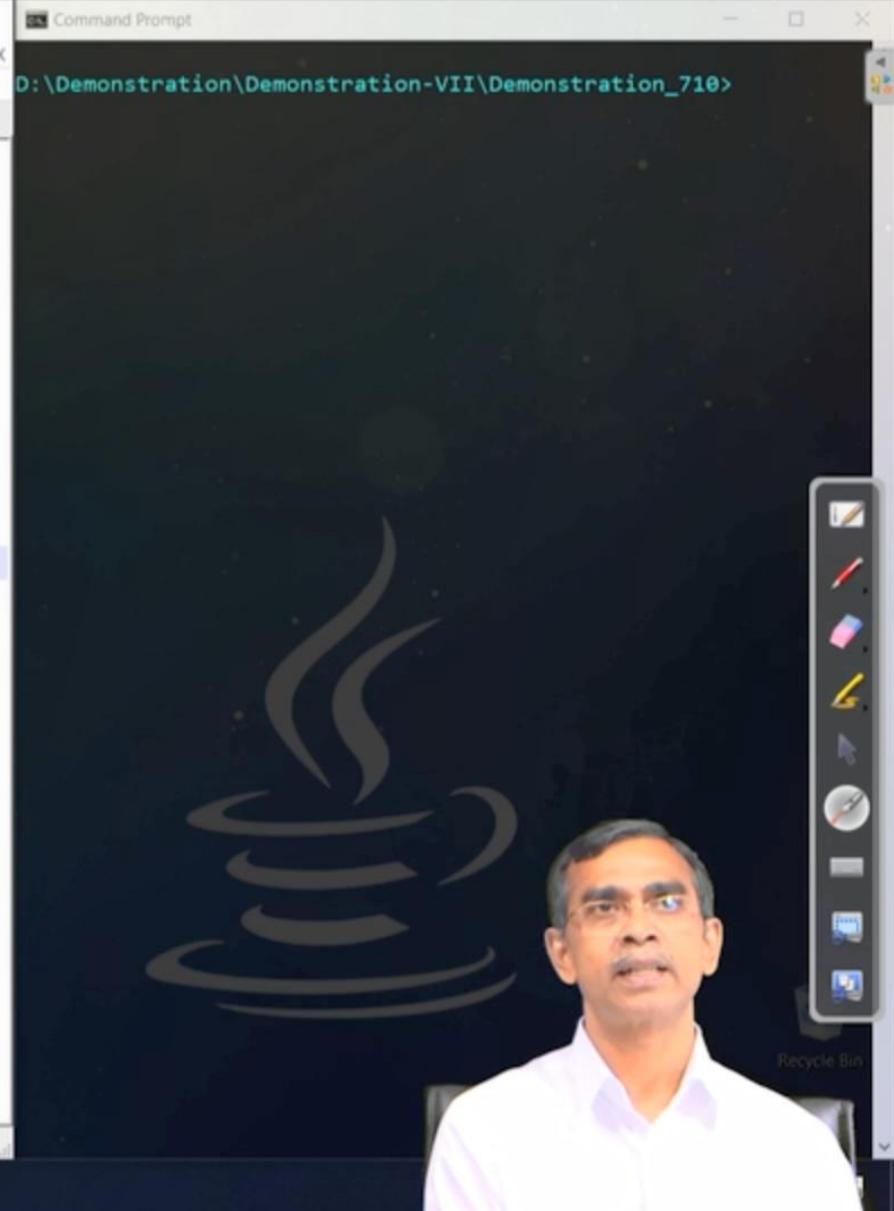
D:\Demonstration\Demonstration-VII\Demonstration_710>

Demonstration_710.java

```
1  /* Example 1: protected modifier */
2
3  class A {
4      protected int rollNo = 555;
5      protected void msg(){
6          System.out.println("Class A: Hello Java!" + rollNo);
7      }
8  }
9
10 class Demonstration_710 {
11     public static void main(String args[]){
12         A obj = new A();
13         obj.msg();
14         obj.rollNo();
15     }
16 }
17
```

Java source file length : 301 lines : 17 Ln : 13 Col : 19 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_710\Demonstration_710.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_710.java X

```
1 /* Example 1: protected modifier */
2
3 class A {
4     protected int rollNo = 555;
5     protected void msg(){
6         System.out.println("Class A: Hello Java!" + rollNo);
7     }
8 }
9
10 class Demonstration_710 {
11     public static void main(String args[]){
12         A obj = new A();
13         obj.msg();
14         obj.rollNo();
15     }
16 }
17
```

Java source file length : 301 lines : 17 Ln:13 Col:19 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_710>javac Demonstration_710.java
Demonstration_710.java:14: error: cannot find symbol
 obj.rollNo();
 ^
symbol: method rollNo()
location: variable obj of type A
1 error

D:\Demonstration\Demonstration-VII\Demonstration_710>



D:\Demonstration\Demonstration-VII\Demonstration_710\Demonstration_710.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_710.java X

```
1  /* Example 1: protected modifier */  
2  
3 class A {  
4     protected int rollNo = 555;  
5     protected void msg(){  
6         System.out.println("Class A: Hello Java!" + rollNo);  
7     }  
8 }  
9  
10 class Demonstration_710 {  
11     public static void main(String args[]){  
12         A obj = new A();  
13         obj.msg();  
14         //obj.rollNo();  
15         System.out.println("Class A: Hello Java!" + rollNo);  
16     }  
17 }  
18
```

Java source file length : 359 lines : 18 Ln:14 Col:11 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_710>javac Demonstration_710.java
Demonstration_710.java:15: error: cannot find symbol
 System.out.println("Class A: Hello Java!" + rollNo);
 ^
 symbol: variable rollNo
 location: class Demonstration_710
1 error
D:\Demonstration\Demonstration-VII\Demonstration_710>



D:\Demonstration\Demonstration-VII\Demonstration_710\Demonstration_710.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_710.java X

```
1  /* Example 1: protected modifier */  
2  
3 class A {  
4     protected int rollNo = 555;  
5     protected void msg(){  
6         System.out.println("Class A: Hello Java!" + rollNo);  
7     }  
8 }  
9  
10 class Demonstration_710 {  
11     public static void main(String args[]){  
12         A obj = new A();  
13         obj.msg();  
14         //obj.rollNo();  
15         System.out.println("Class A: Hello Java!" + obj.rollNo);  
16     }  
17 }  
18
```

Java source file length : 363 lines : 18 Ln: 15 Col: 57 Sel: 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_710>javac Demonstration_710.java

D:\Demonstration\Demonstration-VII\Demonstration_710>java Demonstration_710

Class A: Hello Java!555
Class A: Hello Java!555

D:\Demonstration\Demonstration-VII\Demonstration_710>



D:\Demonstration\Demonstration-VII\Demonstration_711\Demonstration_711.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_711.java

```
1  /* Example 2: protected access specifier*/
2
3  class A{
4      protected int rollNo = 555;
5      public void msg(){
6          System.out.println("Class A: Hello Java!" +rollNo);
7      }
8  }
9
10
11 class Demonstration_711 extends A{
12     public static void main(String args[]){
13         A obj = new A();
14         obj.msg();
15     }
16 }
```

Java source file length : 293 lines : 17 Ln:1 Col:1 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_710>javac Demonstration_710.java

D:\Demonstration\Demonstration-VII\Demonstration_710>java Demonstration_710

Class A: Hello Java!555
Class A: Hello Java!555

D:\Demonstration\Demonstration-VII\Demonstration_710>

*D:\Demonstration\Demonstration-VII\Demonstration_714\Demonstration_714.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_714.java

```
1 /* Simple example of access modifier. In a class hierarchy, private members remain private to their class.
2 This program contains an error and will not compile. */
3
4
5 // Create a superclass.
6 class A {
7     int i; // public by default
8     private int j; // private to A
9
10    void setij(int x, int y) {
11        i = x;
12        j = y;
13    }
14}
15
16 // A's j is not accessible here.
17 class B extends A {
18     int total;
19
20    void sum() {
21        total = i + j; // ERROR, j is not accessible here
22    }
23}
24
25
26 class Demonstration_714{
27     public static void main(String args[]) {
28         B subOb = new B();
29         subOb.setij(10, 12);
30     }
31 }
```

Java source file

length: 666 lines: 34 Ln:2 Col:1 Sel:0 | 0

Type here to search





The image shows a computer screen with two windows open. On the left is a Notepad++ window titled "D:\Demonstration\Demonstration-VII\Demonstration_714\Demonstration_714.java - Notepad++". It contains Java code demonstrating access modifiers. The code includes a superclass A with a private field j, a subclass B extending A with a public field total, and a main method in class Demonstration_714 that creates an instance of B and attempts to use its private field j. The code is as follows:

```
/* Simple example of access modifier. In a class hierarchy, private  
This program contains an error and will not compile.  
  
// Create a superclass.  
class A {  
    int i; // public by default  
    private int j; // private to A  
  
    void setij(int x, int y) {  
        i = x;  
        j = y;  
    }  
  
    // A's j is not accessible here.  
}  
  
class B extends A {  
    int total;  
  
    void sum() {  
        total = i + j; // ERROR, j is not accessible here  
    }  
  
}  
  
class Demonstration_714{  
    public static void main(String args[]) {  
        B subOb = new B();  
        subOb.sum();  
    }  
}
```

On the right is a Command Prompt window titled "Command Prompt" showing the output of the javac command. It displays a compilation error message:

```
D:\Demonstration\Demonstration-VII\Demonstration_714>javac Demonstration_714.java  
Demonstration_714.java:20: error: j has private access in A  
    total = i + j; // ERROR, j is not accessible here  
                                         ^  
1 error
```



D:\Demonstration\Demonstration-VII\Demonstration_714\Demonstration_714.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_714.java X

```
1 /* Simple example of access modifier. In a class hierarchy, private
2 This program contains an error and will not compile. */
3
4
5 // Create a superclass.
6 class A {
7     int i; // public by default
8     protected int j; // private to A
9
10    void setij(int x, int y) {
11        i = x;
12        j = y;
13    }
14}
15
16 // A's j is not accessible here.
17 class B extends A {
18     int total;
19
20     void sum() {
21         total = i + j; // ERROR, j is not accessible here
22     }
23}
24
25
26 class Demonstration_714{
27     public static void main(String args[]) {
28         B subOb = new B();
29         subOb.setij(10, 12);
30         System.out.println("Total is " + subOb.total);
31     }
32 }
```

Java source file length:668 lines:34 Ln:8 Col:14 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_714>java Demonstration_714
Total is 22
D:\Demonstration\Demonstration-VII\Demonstration_714>

D:\Demonstration\Demonstration-VII\Demonstration_715\Demonstration_715.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

D:\Demonstration\Demonstration-VII\Demonstration_715>

```
1 /* Another example of access modifier with public, private and protected members */
2
3 class BaseClass {
4     public int x = 10;
5     private int y = 10;
6     protected int z = 10;
7     int a = 10; //Implicit Default Access Modifier
8
9     public int getX() {
10         return x;
11     }
12
13    public void setX(int x) {
14        this.x = x;
15    }
16
17    private int getY() {
18        return y;
19    }
20
21    private void setY(int y) {
22        this.y = y;
23    }
24
25    protected int getZ() {
26        return z;
27    }
28}
```

Java source file length : 1,590 lines : 70 Ln:1 Col:1 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_715\Demonstration_715.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_715.java X

```
28
29 protected void setZ(int z) {
30     this.z = z;
31 }
32
33 int getA() {
34     return a;
35 }
36
37 void setA(int a) {
38     this.a = a;
39 }
40 }

43 public class Demonstration_715 extends BaseClass {
44     public static void main(String args[]) {
45         BaseClass rr = new BaseClass();
46         rr.z = 0;
47         Demonstration_715 subClassObj = new Demonstration_715();
48         //Access Modifiers - Public
49         System.out.println("Value of x is : " + subClassObj.x);
50         subClassObj.setX(20);
51         System.out.println("Value of x is : " + subClassObj.x);
52         //Access Modifiers - Public
53         // If we remove the comments it would result in a compilation
54         // error as the fields and methods being accessed are p
55 }
```

Java source file length: 1,590 lines: 70 Ln:1 Col:1 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VII\Demonstration_715>

Command Prompt



D:\Demonstration\Demonstration-VII\Demonstration_715\Demonstration_715.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_715.java

```
42
43 public class Demonstration_715 extends BaseClass {
44     public static void main(String args[]) {
45         BaseClass rr = new BaseClass();
46         rr.z = 0;
47         Demonstration_715 subClassObj = new Demonstration_715();
48         //Access Modifiers - Public
49         System.out.println("Value of x is : " + subClassObj.x);
50         subClassObj.setX(20);
51         System.out.println("Value of x is : " + subClassObj.x);
52         //Access Modifiers - Public
53         // If we remove the comments it would result in a compilation
54         // error as the fields and methods being accessed are private
55
56         /* System.out.println("Value of y is : "+subClassObj.y);
57         subClassObj.setY(20);
58         System.out.println("Value of y is : "+subClassObj.y);*/
59
60         //Access Modifiers - Protected
61         System.out.println("Value of z is : " + subClassObj.z);
62         subClassObj.setZ(30);
63         System.out.println("Value of z is : " + subClassObj.z);
64         //Access Modifiers - Default
65         System.out.println("Value of x is : " + subClassObj.a);
66         subClassObj.setA(20);
67         System.out.println("Value of x is : " + subClassObj.a);
68     }
69 }
70 
```

Java source file

Type here to search

length : 1,590 lines : 70 Ln : 52 Col : 10 Sel : 0 | 0



D:\Demonstration\Demonstration-VII\Demonstration_715\Demonstration_715.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_715.java

```
42
43 public class Demonstration_715 extends BaseClass {
44     public static void main(String args[]) {
45         BaseClass rr = new BaseClass();
46         rr.z = 0;
47         Demonstration_715 subClassObj = new Demonstration_715();
48         //Access Modifiers - Public
49         System.out.println("Value of x is : " + subClassObj.x);
50         subClassObj.setX(20);
51         System.out.println("Value of x is : " + subClassObj.x);
52         //Access Modifiers - Public
53         // If we remove the comments it would result in a compilation
54         // error as the fields and methods being accessed are private
55
56         /* System.out.println("Value of y is : "+subClassObj.y);
57         subClassObj.setY(20);
58         System.out.println("Value of y is : "+subClassObj.y);*/
59
60         //Access Modifiers - Protected
61         System.out.println("Value of z is : " + subClassObj.z);
62         subClassObj.setZ(30);
63         System.out.println("Value of z is : " + subClassObj.z);
64         //Access Modifiers - Default
65         System.out.println("Value of x is : " + subClassObj.a);
66         subClassObj.setA(20);
67         System.out.println("Value of x is : " + subClassObj.a);
68     }
69 }
70 }
```

Java source file

Type here to search

length : 1,590 lines : 70 Ln:51 Col:9 Sel:0|0



D:\Demonstration\Demonstration-VII\Demonstration_716\Demonstration_716.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_716.java

```
9     private void msg2() {
10         System.out.println("Class A: Private!");
11     }
12     protected void msg3(){
13         System.out.println("Class A: Protected!");
14     }
15 }
16
17 public class Demonstration_716 extends A{
18     void msg(){
19         System.out.println("Class Main: Welcome!");
20     }
21     public void msg1() { // If modifire is set to default it cannot override.
22         System.out.println("Overriding public method!");
23     }
24
25     void msg2() {
26         System.out.println("Overriding private method!");
27     }
28     // If modifire is set to private it can be overridden.
29     public void msg3(){
30         System.out.println("Overriding protected method!");
31     }
32
33
34     public static void main(String args[]){
35         Demonstration_716 obj = new Demonstration_716();
36         obj.msg();
37         //obj.msg1();
38         //    ...
39     }
}
```

Java source file

length : 1,139 lines : 45 Ln : 1 Col : 1 Sel : 0 | 0

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_716\Demonstration_716.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_716.java

```
1  /* Example of method-overriding */
2
3
4 class A{
5     public void msg1() {
6         System.out.println("Class A: Public!");
7     }
8
9     private void msg2() {
10        System.out.println("Class A: Private!");
11    }
12    protected void msg3(){
13        System.out.println("Class A: Protected!");
14    }
15 }
16
17 public class Demonstration_716 extends A{
18     void msg(){
19         System.out.println("Class Main: Welcome!");
20     }
21     public void msg1() { // If modifire is set to default it cannot override.
22         System.out.println("Overriding public method!");
23     }
24
25     void msg2() {
26         System.out.println("Overriding private method!");
27     }
28     // If modifire is set to private it can be overridden.
29 }
```

Java source file length : 1,139 lines : 45 Ln : 1 Col : 1 Sel : 0 | 0

Type here to search



Backward 5 sec - [00:33:51 / 90%]

```
17 public class Demonstration_716 extends A{
18     void msg(){
19         System.out.println("Class Main: Welcome!");
20     }
21     public void msg1() { // If modifire is set to default it cannot overide.
22         System.out.println("Overriding public method!");
23     }
24
25     void msg2() {
26         System.out.println("Overriding private method!");
27     }
28     // If modifire is set to private it can be overridden.
29     public void msg3(){
30         System.out.println("Overriding protected method!");
31     }
32
33
34     public static void main(String args[]){
35         Demonstration_716 obj = new Demonstration_716();
36         obj.msg();
37         //obj.msg1();
38         //obj.msg2();
39         //obj.msg3();
40     }
41
42
43
44
45 }
```

Java source file length : 1,139 lines : 45 Ln : 1 Col : 1 Sel : 0 | 0

Type here to search



D:\Demonstration\Demonstration-VII\Demonstration_716\Demonstration_716.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_716.java

```
1  /* Example of method-overriding */
2
3
4 class A{
5     public void msg1() {
6         System.out.println("Class A: Public!");
7     }
8
9     private void msg2() {
10        System.out.println("Class A: Private!");
11    }
12    protected void msg3(){
13        System.out.println("Class A: Protected!");
14    }
15 }
16
17 public class Demonstration_716 extends A{
18     void msg(){
19         System.out.println("Class Main: Welcome!");
20     }
21     public void msg1() { // If modifire is set to default it cannot override.
22         System.out.println("Overriding public method!");
23     }
24
25     void msg2() {
26         System.out.println("Overriding private method!");
27     }
28     // If modifire is set to private it can be overridden.
29 }
```

Java source file

Type here to search

length : 1,139 lines : 45 Ln : 1 Col : 1 Sel : 0 | 0



D:\Demonstration\Demonstration-VII\Demonstration_716\Demonstration_716.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_716.java

```
1  /* Example of method-overriding */
2
3
4  class A{
5      public void msg1() {
6          System.out.println("Class A: Public!");
7      }
8
9      private void msg2() {
10         System.out.println("Class A: Private!");
11     }
12     protected void msg3(){
13         System.out.println("Class A: Protected!");
14     }
15 }
16
17 public class Demonstration_716 extends A{
18     void msg(){
19         System.out.println("Class Main: Welcome!");
20     }
21     public void msg1() { // If modifire is set to default it cannot override.
22         System.out.println("Overriding public method!");
23     }
24
25     void msg2() {
26         System.out.println("Overriding private method!");
27     }
28     // If modifire is set to private it can be overridden.
29 }
```

Java source file

Type here to search

length : 1,139 lines : 45 Ln:26 Col:19 Sel:7|1



Demonstration_716

File Home Share View

Pin to Quick access Copy Paste Cut Copy path Move to Copy to Delete Rename New folder Properties Open Select all Select none Invert selection Open Select

Clipboard

Demonstration > Demonstration-VII > Demonstration_716

Name Date modified Type Size

Name	Date modified	Type	Size
Aclass	17-Nov-18 8:20 PM	CLASS File	1 KB
Demonstration_716.class	17-Nov-18 8:20 PM	CLASS File	1 KB
Demonstration_716.java	17-Nov-18 8:22 PM	JAVA File	2 KB

Quick access

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- Demonstration-VII
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Program (D:)

Network

3 items 1 item selected 1.11 KB

Command Prompt

```
D:\Demonstration\Demonstration-VII\Demonstration_716>javac Demonstration_716.java
javac: invalid flag: Demonstration_716.class
Usage: javac <options> <source files>
use -help for a list of possible options

D:\Demonstration\Demonstration-VII\Demonstration_716>ja
```



The video shows a man with glasses and a white shirt speaking. Behind him is a large Java logo (a steaming coffee cup) and a vertical toolbar on the right.

Demonstration_716

File Home Share View

Pin to Quick access Copy Paste Move to Copy path Paste shortcut Cut Delete Rename New folder Properties Open Select all Edit History Select Invert selection

Clipboard

Organize New

Open Select

← → ↑ ↓ Demonstration > Demonstration-VII > Demonstration_716 Search Demonst...

Name Date modified Type Size

Aclass 18-Nov-18 5:36 PM CLASS File 1 KB

Demonstration_716.class 18-Nov-18 5:36 PM CLASS File 1 KB

Demonstration_716.java 17-Nov-18 8:22 PM JAVA File 2 KB

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Program (D:)

Network

3 items 1 item selected 1.11 KB

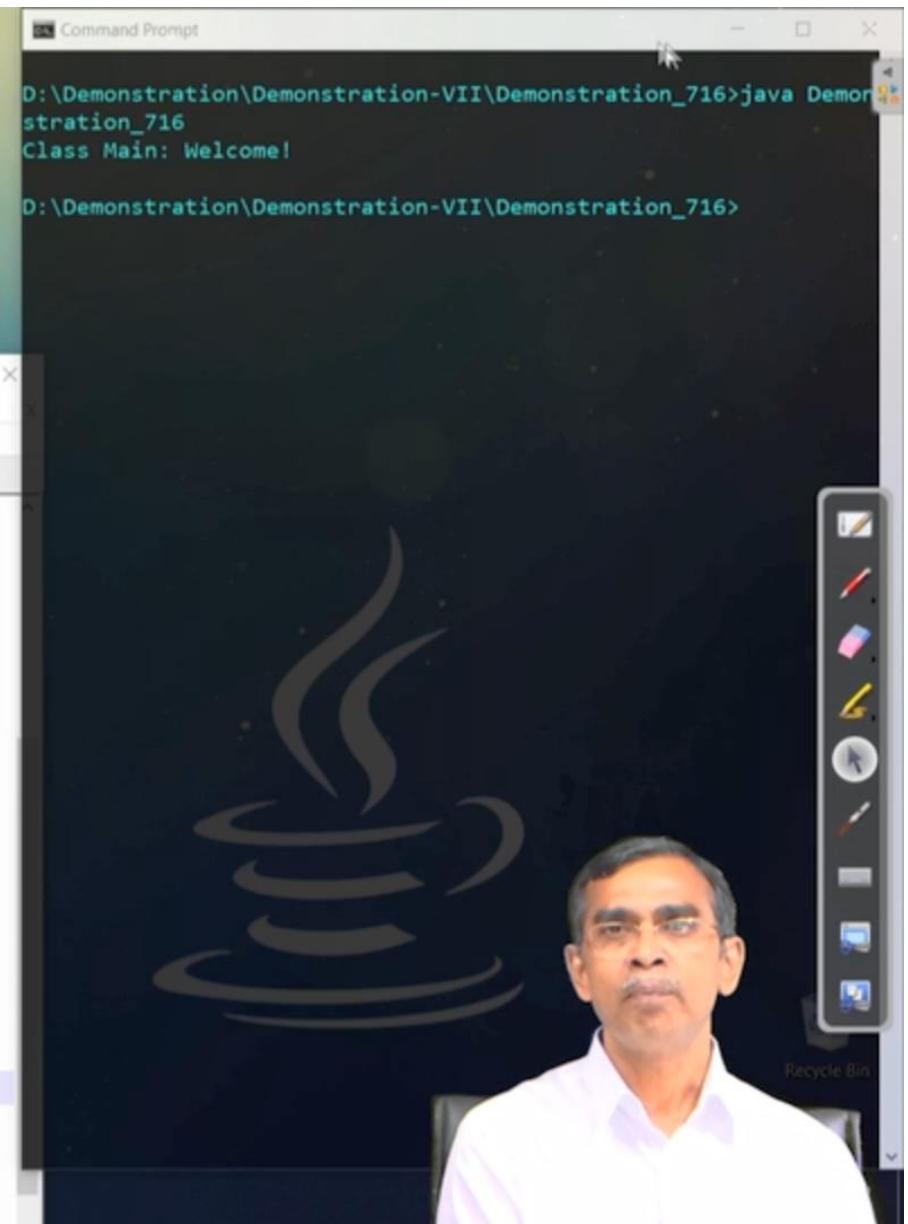
```
public static void main(String args[]){}
```

Command Prompt

D:\Demonstration\Demonstration-VII\Demonstration_716>java Demonstration_716

Class Main: Welcome!

D:\Demonstration\Demonstration-VII\Demonstration_716>





Two unique features in Java



Java's two most innovative features are:

Packages Interfaces



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What is a package?

A **package** is a container for the classes that are used to keep the class name space compartmentalized

Example:

You can contain all classes related to all sorting programs in your own package.



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Why packages?

It allows flexibility to give same name but to many classes, that is to avoid **name space collision**.

The packages in Java provides mechanism for partitioning the class name space into more manageable chunks.

In fact, package is both a **naming** and a **visibility** control mechanism.

It supports **reusability** and **Maintainability**.



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Advantages of Packages

Packages provide **code reusability**, because a package contains group of classes.

It helps in **resolving naming collision** when multiple packages have classes with the same name.

Package also provides the **hiding of class** facility. Thus, other programs cannot use the classes from hidden package.

Access limitation can be applied with the help of packages.

Nesting of a package, that is, one package can be defined in another package in a **hierarchy fashion**.



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Built-in packages in Java

Packages are nothing more than the way we organize files into different directories according to their functionality, usability as well as category they should belong to . A **Java package** is a **Java** programming language mechanism for organizing classes into name spaces.

In **Java**, already many predefined packages are available, those are to help programmers to develop their software in an easy way.

Example:

javax.swing is a package in **Java** providing all basic supports in developing GUI pro



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Packages in Java

- **Code reusability** is the main philosophy of Object-Oriented Programming.
- To power this advantage, Java has a number of **packages called API** bundled with the **JDK**.
- Packages are **collection of classes and interfaces** to facilitate a number of ready made solutions.
- A great **knowledge of packages** helps a **Java developer** to master in **Java solution**.
- In addition to the API, **user can maintain their own packages**.

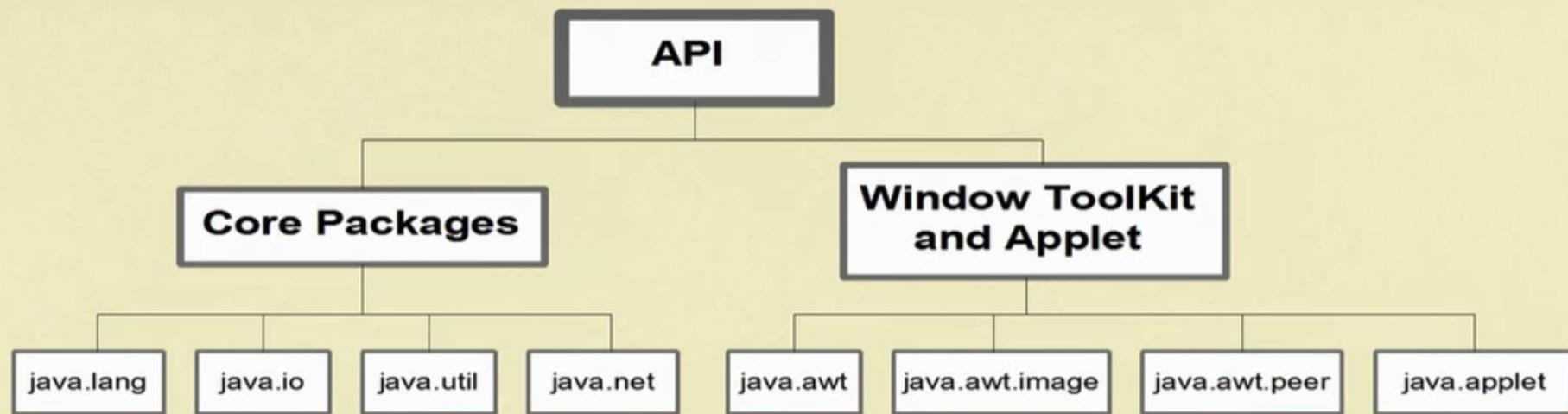


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API – The Built-in Java packages



javax.swing is the latest addition in Java version 5 above.



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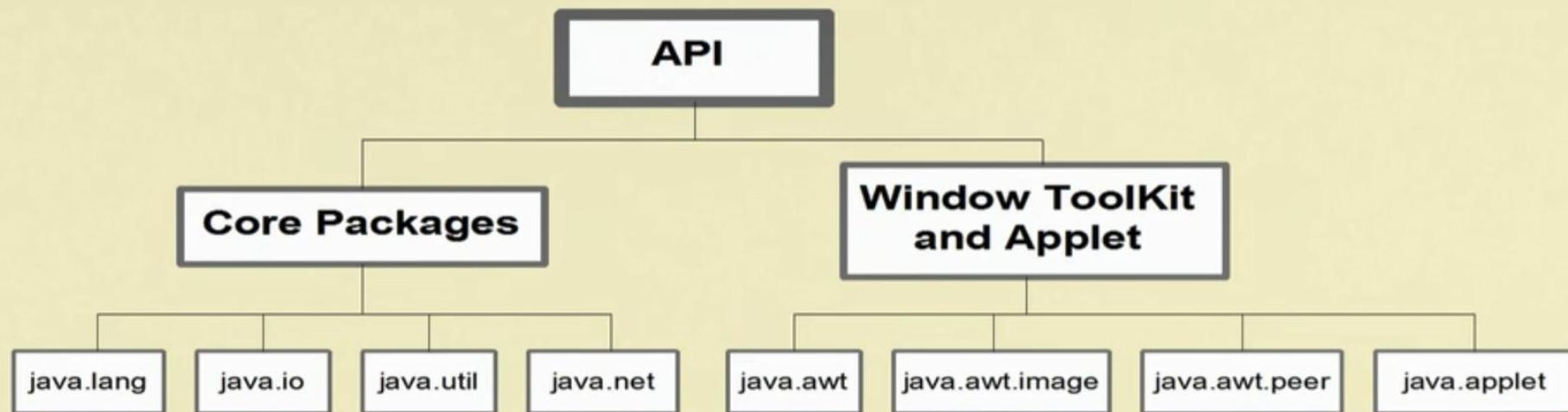


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API – The Built-in Java packages



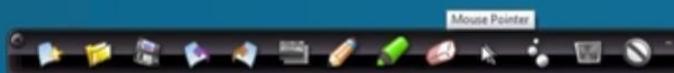
javax.swing is the latest addition in Java version 5 and above.



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Using API packages

- A package is a collection of classes and each class is a collection of members and methods.
- Any class as well as any member and method in a package are accessible from a Java program
- This can be achieved in Java by **import** statement.

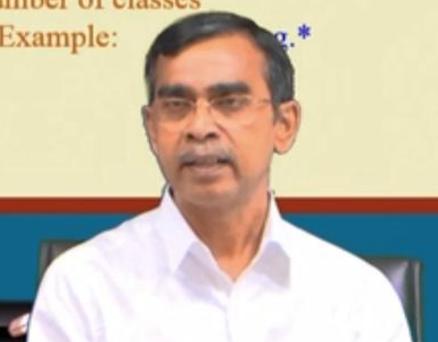
There are two ways of using **import** statement

With fully quantified class name

- When it is required to access a particular class
- Example: `java.lang.String`

With default (.*) quantification

- When it is required to access a number of classes
- Example: `g.*`





Using API packages

However, instead of importing whole package or a class it is possible to refer a class in order to instantiate an object.

Example:

```
java.util.Date toDay = new java.util.Date ( );
System.out.println(toDay);
```

The same thing but with **import statement** can be done as follows

```
import java.util.Date;
Date today = new Date( );
```



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Defining Packages in Java



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User defined packages

- User can maintain their own package.
- Java uses file system directories to store packages.
- The **package** statement can be used for the purpose with the following syntax

```
package myPackage;  
public Class myClass {  
    . . .  
    . . .  
}
```

Here, **myPackage** is the name of the package and it contains the class **myClass**.



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User defined packages

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public Class myClass {  
    . . .  
    . . .  
}
```

Here, **myPackage** is the name of the package and it contains the class **myClass**.



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Package naming conventions

- Packages are usually defined using a **hierarchical naming pattern**, with levels in the hierarchy separated by **periods (.)**.
- Although packages lower in the naming hierarchy are often referred to as "**sub packages**" of the corresponding packages higher in the hierarchy, there is no semantic relationship between packages.



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Organizational package naming conventions

- Package names should be **all lowercase characters** whenever possible.
- Frequently, a package name begins with the top level domain name of the organization and then the organization's domain and then any subdomains listed in the reverse order.
- The organization can then choose a specific name for their package.



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User defined packages

In addition to this, following steps must be taken into consideration

- Use package statement at the beginning of the package file.
- Define the class that is to be put in the package **and declare it as public**.
- Create a sub directory under the working directory with the same name as the package name.
- Store the file with the same name as the **className.java** in the subdirectory created.
- Store the **compiled version** (i.e., **.class**) file into the same sub-directory.



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Package design guidelines

Design guideline package cohesion

- Only **closely related classes** should belong to the same package.
- Classes that change together should belong to the same package.
- Classes that are not reused together should not belong to the same package.



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Package declaration

Package declaration is file based

- All classes in the same source file belong to the same package.
- Each source file may contain an optional package declaration in the following form.

package <PackageName>;

- Let us consider the source file `ElevatorFrame.java`, for example.

```
package elevator;
public class ElevatorFrame {
    public double x;
    //.....
}
```



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Package declaration

- The package declaration at the top of the source file declares that the `ElevatorFrame` class belongs to the package named `elevator`.
- When the package declaration is absent from a file, all the classes contained in the file belong to unnamed package.
- A class in a named package can be referred in two ways.



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User defined packages: Example

```
// User defined package in a subdirectory, say MyPackage
package MyPackage;
public class MyClass {
    public void test () {
        System.out.println ( " Welcome to My Class !" );
    }
}
/* Import the package with the following code. From another distant file/
program */
import MyPackage.MyClass;
class PackageTestAppln {
    public static void main ( String args [ ] ) {
        MyClass theClass = new MyClass ( );
        theClass.test ( );
    }
}
```

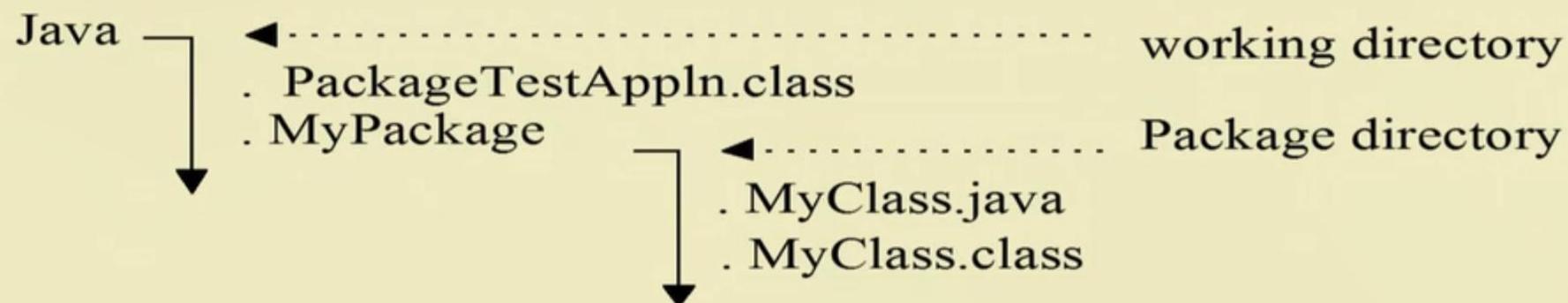


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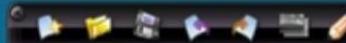




User defined packages: Example



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More on user defined packages

Note:

We cannot put two or more public classes together in a .java file; otherwise there will be an ambiguity in naming the .java file

? How a package then contains multiple classes?

Solution:

```
package P;  
public class A {  
    ...  
}
```



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More on user defined packages

Note:

We cannot put two or more public classes together in a .java file; otherwise there will be an ambiguity in naming the .java file

? How a package then contains multiple classes?

Solution:

```
package P;  
public class A {  
    ...  
}
```

```
package P;  
public class B {  
    ...  
}
```



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More on user defined packages

```
package P;
public class A {
    . .
}
```

```
package P;
public class B {
    . .
}
```

Steps

1. Create a directory named **P**.
2. Store the **class A** in the file **A.java** in it
3. Compile **A.java** and place it in the directory **P**.
4. Store the **class B** in the file **B.java** in it
5. Compile **B.java** and place it in the directory **P**.
6. **import P.*;**
will import all classes in the package



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Question to think...

- How a package can be accessed in any program?
- Is it possible that two classes having the same name but in two different packages are to be used in another class outside the packages?



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Finding packages and CLASSPATH

How does the Java run-time system know where to look for packages that you create?

The answer has three parts

- First, by default, the Java run-time system uses the current working directory as its starting point. Thus, if your package is in a sub-directory of the current directory, it will be found.
- Second, you can specify a directory path or paths by setting the CLASSPATH environmental variable.
- Third, you can use the -classpath option with `java` and `javac` to specify the path to your classes.



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Finding packages and CLASSPATH: Example

Consider the following package specification:

```
package MyPack;
```

For a program
to find
MyPack, one
of three things
must be true.

- The program can be executed from a directory immediately above *MyPack*
- The CLASSPATH must be set to include the path to *MyPack*
- The -classpath option must specify the path to *MyPack* when the program is run via `java`.

When the second two options are used, the class path must not include *MyPack*, itself. It must simply specify the path to *MyPack*.

Example: In a Windows environment, if the path to *MyPack* is

C:\MyPrograms\Java\MyPack
then the class path to *MyPack* is

C:\MyPrograms\Java

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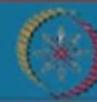


Finding packages and CLASSPATH: Example

```
package MyPack;
class Balance {
    String name;
    double bal;
    Balance(String n, double b) {
        name = n;
        bal = b;
    }
    void show() {
        if(bal<0)
            System.out.print("Account is dead");
        else
            System.out.print(name+": $ "+bal);
    }
}
```



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Finding packages and CLASSPATH: Example

```
package MyPack;
class Balance {
    String name;
    double bal;
    Balance(String n, double b) {
        name = n;
        bal = b;
    }
    void show() {
        if(bal<0)
            System.out.print("Account is dead");
        else
            System.out.print(name+": $ "+bal);
    }
}
```

✓

```
class AccountBalance {
    public static void main(String args[]) {
        Balance current[] = new Balance[3];
        current[0] = new Balance("K. J. Fielding", 123.23);
        current[1] = new Balance("Will Tell", 157.02);
        current[2] = new Balance("Tom Jackson", -12.33);
        for(int i=0; i<3; i++)
            current[i].show();
    }
}
```



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Finding packages and CLASSPATH: Example

```
package MyPack;
class Balance {
    String name;
    double bal;
    Balance(String n, double b) {
        name = n;
        bal = b;
    }
    void show() {
        if(bal<0)
            System.out.print("Account is dead");
        else
            System.out.print(name+": $ "+bal);
    }
}
```

import MyPack

```
class AccountBalance {
    public static void main(String args[]) {
        Balance current[] = new Balance[3];
        current[0] = new Balance("K. J. Fielding", 123.23);
        current[1] = new Balance("Will Tell", 157.02);
        current[2] = new Balance("Tom Jackson", -12.33);
        for(int i=0; i<3; i++)
            current[i].show();
    }
}
```



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Finding packages and CLASSPATH: Example

Call this file
AccountBalance.java and put
it in a directory called
MyPack.

Then, try executing the
AccountBalance class, using
the following command line:
`java MyPack.AccountBalance`

Next, compile the file. Make
sure that the resulting .class
file is also in the *MyPack*
directory.

Remember, you will need
to be in the directory
above *MyPack* when you
execute this command.

As explained, *AccountBalance* is now part of the package *MyPack*. This means that it cannot be executed by itself.
That is, you cannot use this command line:

```
java AccountBalance
```



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Importing a package

This is the general form of the import statement:

```
import pkg1 [.pkg2].<classname> | *;
```

Here, **pkg1** is the name of a top-level package

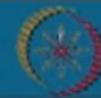
pkg2 is the name of a sub-ordinate package inside the outer package separated by a dot (.).

There is no practical limit on the depth of a package hierarchy, except that imposed by the file system.

Finally, you specify either an explicit class name or a star (*), which indicates that the Java compiler should import the entire package.

Example:

```
import java.util.Date;  
import java.io.*;
```



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Using package

Class in a named package can be referred to in two different ways

Import a class or all the classes in the designated package using

```
import PackageName.<ClassName>;  
import Packagename.*;
```

Example

The `ElevatorPanel` class in package elevator can simply be referred to as elevator when either of the following import clauses occurs at the top of source file

```
import elevator.ElevatorPanel;  
import elevator.*;
```



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Access protection

Because of the interplay between classes and packages, Java addresses four categories of visibility for class members:

- Sub classes in the same package.
- Non-sub classes in the same package.
- Sub classes in different packages.
- Classes that are neither in the same package nor sub classes.

The three access modifiers, `private`, `public`, and `protected`, provide a variety of ways to produce the many levels of access required by these categories.



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Access protection

	Private	No Modifier	Protected	Public
Same class	Yes	Yes	Yes	Yes
Same package subclass	No	Yes	Yes	Yes
Same package non-subclass	No	Yes	Yes	Yes
Different package subclass	No	No	Yes	Yes
Different package non-subclass	No	No	No	Yes





Access protection: An example

```
//This program shows all combinations of the access control modifiers  
//In this program, we define two packages and five classes.
```

```
MyPackage1:
```

```
    class X  
    class Y extends X  
    class A
```

```
MyPackage2:
```

```
    class Z extends X  
    class B
```



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Access protection: An example

```
// Defining package MyPackage1
package MyPackage1;

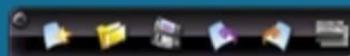
public class X {
    int n = 1;
    private int p = 2;
    protected int q = 3;
    public int r = 4;
    // A constructor of the class protection
    public X() {
        system.out.println("I am constructor from class X:");
        system.out.println("n=" + n);
        system.out.println("p=" + p);
        system.out.println("q=" + q);
        system.out.println("r=" + r);
    }
}
//Save this as X.java in Mypackage1 directory
```



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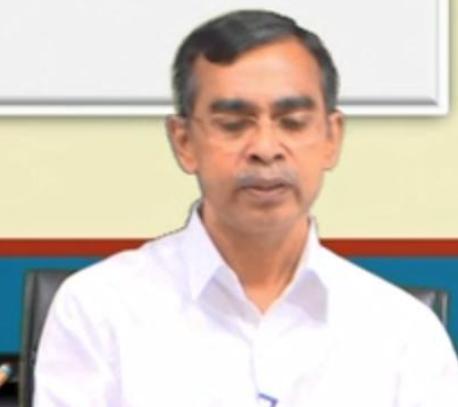
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Access protection: An example

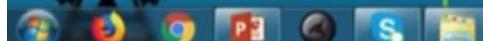
```
package MyPackage1
class Y extends X {
    Y() {
        system.out.println("I am constructor from class Y:");
        system.out.println("n="+n);
        system.out.println("p="+p);
        // Error p is a private member of X. Not accessible outside X.
        system.out.println("q="+q);    // Protected is accessible
        system.out.println("r="+r);    // public is accessible
    }
}
//Save this as Y.java in Mypackage1 directory
```



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13:03
8-11-2018



Access protection: An example

```
// Defining package MyPackage1
package MyPackage1
public class X {
    int n = 1;
    private int p = 2;
    protected int q = 3;
    public int r = 4;
    // A constructor of the class protection
}
//Save this as X.java in
```

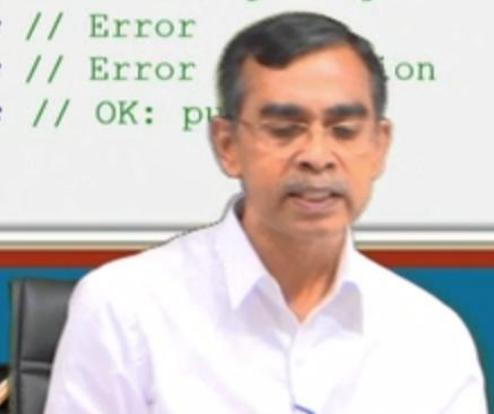
```
//Save this as A.java in Mypackage1 directory
class A {                  // class with default protection
    A() {                  // default constructor with default access
        X x = new X();    // create an object of class X
        System.out.println("Same package constructor ....");
        System.out.println("n from A"+x.n);
        // Default variable is accessible in the same package
        System.out.println("p from A"+x.p); // Error
        System.out.println("q from A"+x.q); // Error
        System.out.println("r from A"+x.r); // OK: pu
    }
}
```



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Access protection: An example

```
// Defining package MyPackage1
package MyPackage1;
public class X {
    int n = 1;
    private int p = 2;
    protected int q = 3;
    public int r = 4;
    // A constructor of the class protection
}
//Save this as X.java in Mypackagel directory
```

```
//Save this as Z.java in Mypackage2 directory
package MyPackage1;
class Z extends MyPackage1.X {
    Z() {
        System.out.println("I am constructor from class Z:");
        System.out.println("n from Z"+n); // Error:
        // Default is not accessible outside its package.
        System.out.println("p from Z"+p); // Error : private of X
        System.out.println("q from Z"+q);
            // Protected member is accessible by inheritance
        System.out.println("r from Z"+r);
            // public is accessible
    }
}
```



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13:08
18-11-2018

Pause



Access protection: An example

```
//Save this as B.java in Mypackage2 directory
class B {                                // class with default protection
    B() {        // default constructor with default access
        MyPackage1.X x = new MyPackage1.X()
        // create an object of class X
        System.out.println("I am constructor from class B of MyPackage2");
        System.out.println("n from B of myPackage2"+x.n);
        // default variable but is not accessible in this package
        System.out.println("p from B of myPackage2"+x.p);
        // Error
        System.out.println("q from B of myPackage2"+x.q);
        // Error protection
        System.out.println("r from A of myPackage2"+x.r);
    }
}
```



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13:11
18-11-2018



Access protection: An example

```
//This is the demo of MyPackage1
package MyPackage1;
public class Demo1{
    public static void main(String args[])
        X x1 = new X();
        Y y1 = new Y();
        A a1 = new A();
}
```

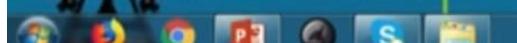
```
//This is the demo of MyPackage2
package MyPackage2;
public class Demo2{
    public static void main(String args[])
        Z z2 = new Z();
        B a2 = new B();
}
```



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13:12

18-11-2018

D:\Demonstration\Demonstration-VIII\Demonstration_81\Demonstration_81.java - Notepad++

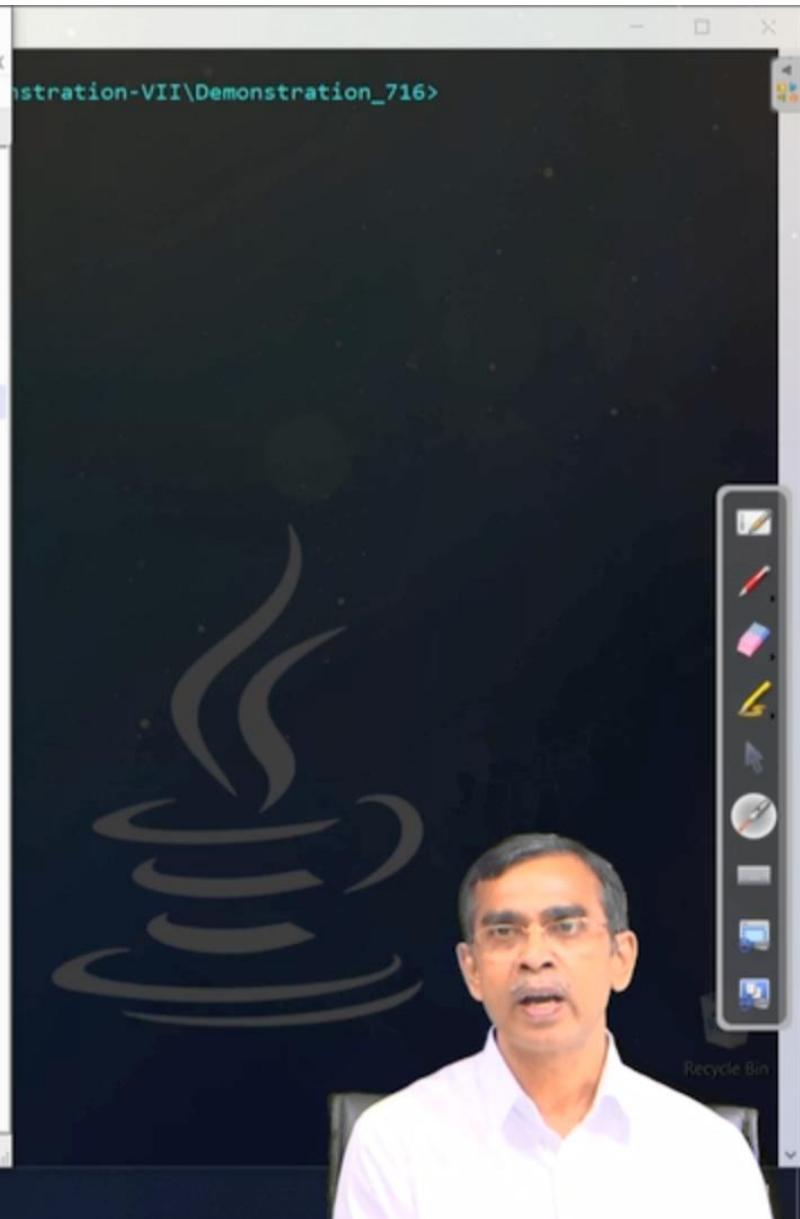
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_81.java

```
1 // Accessing a package from a Java built-in APIs
2
3 import java.lang.*; //Math class is defined in this package
4
5 class Calculator{
6     double i;
7     double x ;
8     void p(){
9         x = Math.sqrt(i);
10    }
11 }
12
13
14 class Demonstration_81{
15     public static void main(String args[]){
16         Calculator a = new Calculator();
17         a.i = 20.0;
18         a.p();
19         System.out.println("Square root of "+a.i+" is "+a.x);
20     }
21 }
22
```

Java source file length : 447 lines : 22 Ln : 8 Col : 17 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

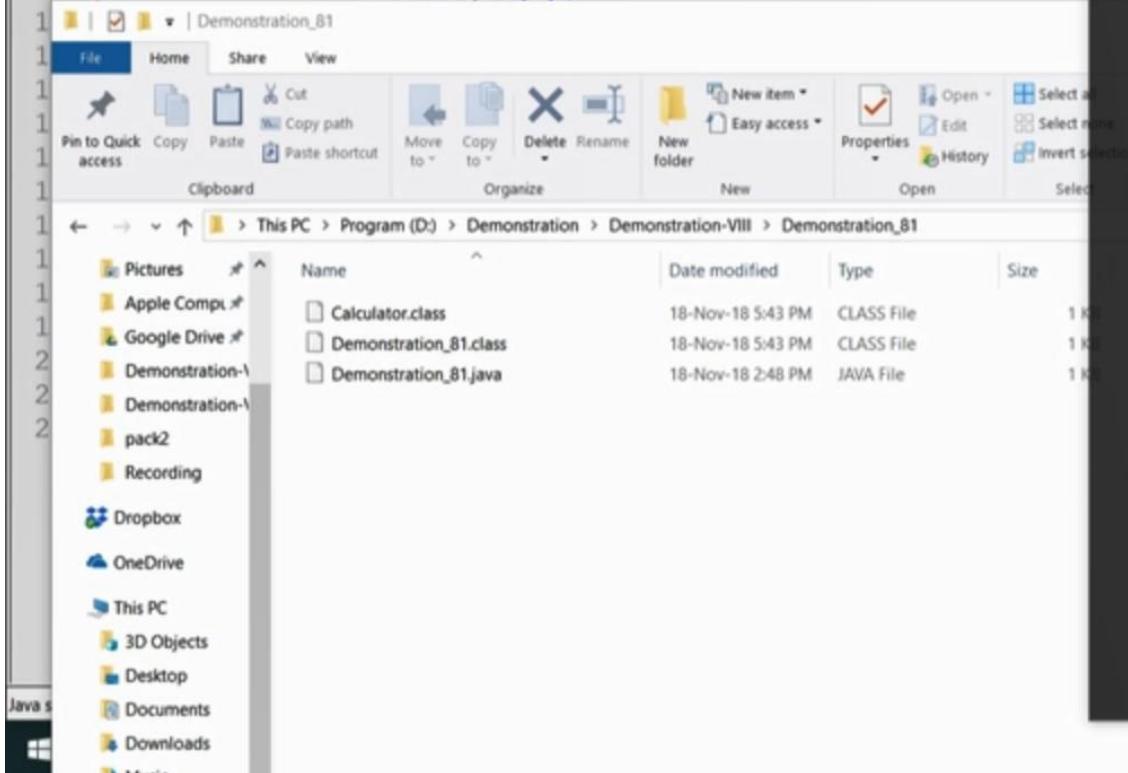
Type here to search



Backward 5 sec - [00:04:47 / 14%]

```
D:\Demonstration\Demonstration-VIII\Demonstration_81>Demonstration_81.java - NotePad++  
Demonstration_81.java  
1 // Accessing a package from a Java built-in APIs  
2  
3 import java.lang.*; //Math class is defined in this package  
4  
5 class Calculator{  
6     double i;  
7     double x ;  
8     void p(){  
9         x = Math.sqrt(i);
```

```
Command Prompt D:\Demonstration\Demonstration-VIII\Demonstration_81>javac Demonstration_81.java  
D:\Demonstration\Demonstration-VIII\Demonstration_81>java Demonstration_81  
Square root of 20.0 is 4.47213595499958  
D:\Demonstration\Demonstration-VIII\Demonstration_81>
```



Backward 5 sec -[00:05:23 / 15%]

```
1  /* Java program to demonstrate accessing of members when i
2
3 import java.util.Vector;
4
5 class Demonstration_82 {
6     public Demonstration_82()    {
7         // java.util.Vector is imported, hence we are
8         // able to access directly in our code.
9         Vector newVector = new Vector();
10        // The code dealing with the object newVector.....
11    }
12
13    public static void main(String arg[])
14    {
15        //Here is the code in the main class...
16    }
17}
18
```

Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_81>javac Demonstration_81.ja
va
D:\Demonstration\Demonstration-VIII\Demonstration_81>java Demonstration_81
Square root of 20.0 is 4.47213595499958
D:\Demonstration\Demonstration-VIII\Demonstration_81>
```



Vol: 95%

D:\Demonstration\Demonstration-VIII\Demonstration_82\Demonstration_82.java - Notepad++

Demonstration_82.java

```
1  /* Java program to demonstrate accessing of members when i
2
3 import java.util.Vector;
4
5 class Demonstration_82 {
6     public Demonstration_82()    {
7         // java.util.Vector is imported, hence we are
8         // able to access directly in our code.
9         Vector newVector = new Vector();
10        // The code dealing with the object newVector.....
11    }
12
13    public static void main(String arg[])
14    {
15        //Here is the code in the main class...
16    }
17}
18
```

Java : length: 497 lines: 18 Ln:1 Col:1 Sel:0|0 Windows (CR LF) UTF-8 INS

Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_81>javac Demonstration_81.ja
va
D:\Demonstration\Demonstration-VIII\Demonstration_81>java Demonstration_81
Square root of 20.0 is 4.47213595499958
D:\Demonstration\Demonstration-VIII\Demonstration_81>
```

Search Demonstration_81.p





D:\Demonstration\Demonstration-VIII\Demonstration_83\Demonstration_83.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

D:\Demonstration\Demonstration-VIII\Demonstration_83\Demonstration_83.java

```
1  /* Java program to demonstrate accessing of members when i
2
3 public class Demonstration_83 {
4     public Demonstration_83() {
5         java.util.ArrayList newList = new java.util.ArrayList();
6
7         // java.util.ArrayList is not imported, hence we ref
8         // to it using the complete package.
9
10        // The code dealing with the object newList.....
11    }
12
13
14    public static void main(String arg[]) {
15        //Here is the code in the main class...
16    }
17
18 }
```

D:\Demonstration\Demonstration-VIII\Demonstration_81>javac Demonstration_81.ja
va

D:\Demonstration\Demonstration-VIII\Demonstration_81>java Demonstration_81
Square root of 20.0 is 4.47213595499958

D:\Demonstration\Demonstration-VIII\Demonstration_81>

Java : length: 532 lines: 18 Ln:1 Col:1 Sel:0|0 Windows (CR LF) UTF-8 INS

Type here to search

D:\Demonstration\Demonstration-VIII\Demonstration_83\Demonstration_83.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_83.java

```
1  /* Java program to demonstrate accessing of members when it is not imported explicitly*/
2
3 public class Demonstration_83 {
4     public Demonstration_83() {
5         java.util.ArrayList newList = new java.util.ArrayList();
6
7         // java.util.ArrayList is not imported, hence we referring
8         // to it using the complete package.
9
10        // The code dealing with the object newList....
11
12    }
13
14    public static void main(String arg[]) {
15        //Here is the code in the main class...
16    }
17
18 }
```

Java source file length : 532 lines : 18 Ln : 3 Col : 33 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search

Demonstration_81>javac Demonstration_81.java
Demonstration_81>java Demonstration_81
Demonstration_81>

D:\Demonstration\Demonstration-VIII\Demonstration_84\Demonstration_84.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_83.java Demonstration_84.java

```
1 /* Importing an entire package, that is, all classes in a package */
2
3 import java.util.*;
4
5 public class Demonstration_84 {
6     public Demonstration_84() {
7         Vector newVector = new Vector();
8         // java.util.Vector is imported, hence we are
9         // able to access directly in our code.
10
11     ArrayList newList = new ArrayList();
12
13     // java.util.ArrayList is imported, hence
14     // we are able to access it directly in the program
15     // package.
16 }
17
18 public static void main(String arg[])
19 {
20     // The code dealing with the object newVector and newList....
21
22 }
23
24 }
```

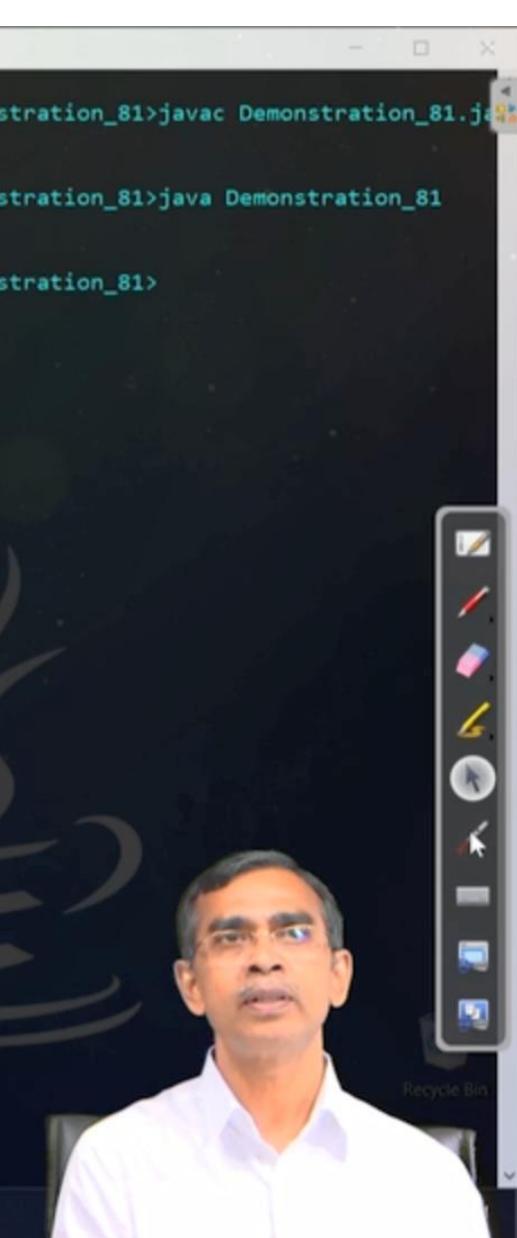
monstration_81>javac Demonstration_81.java

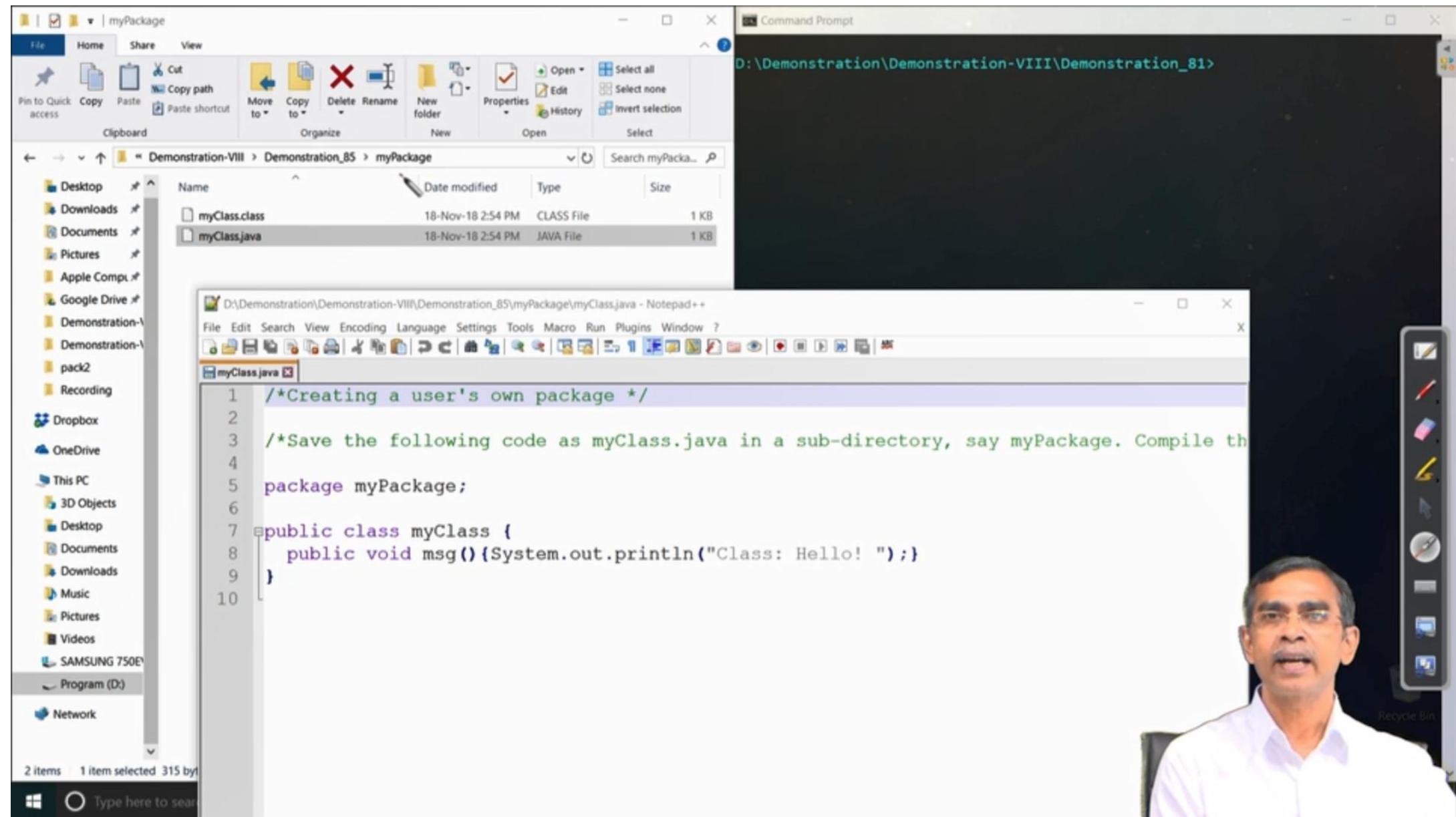
monstration_81>java Demonstration_81

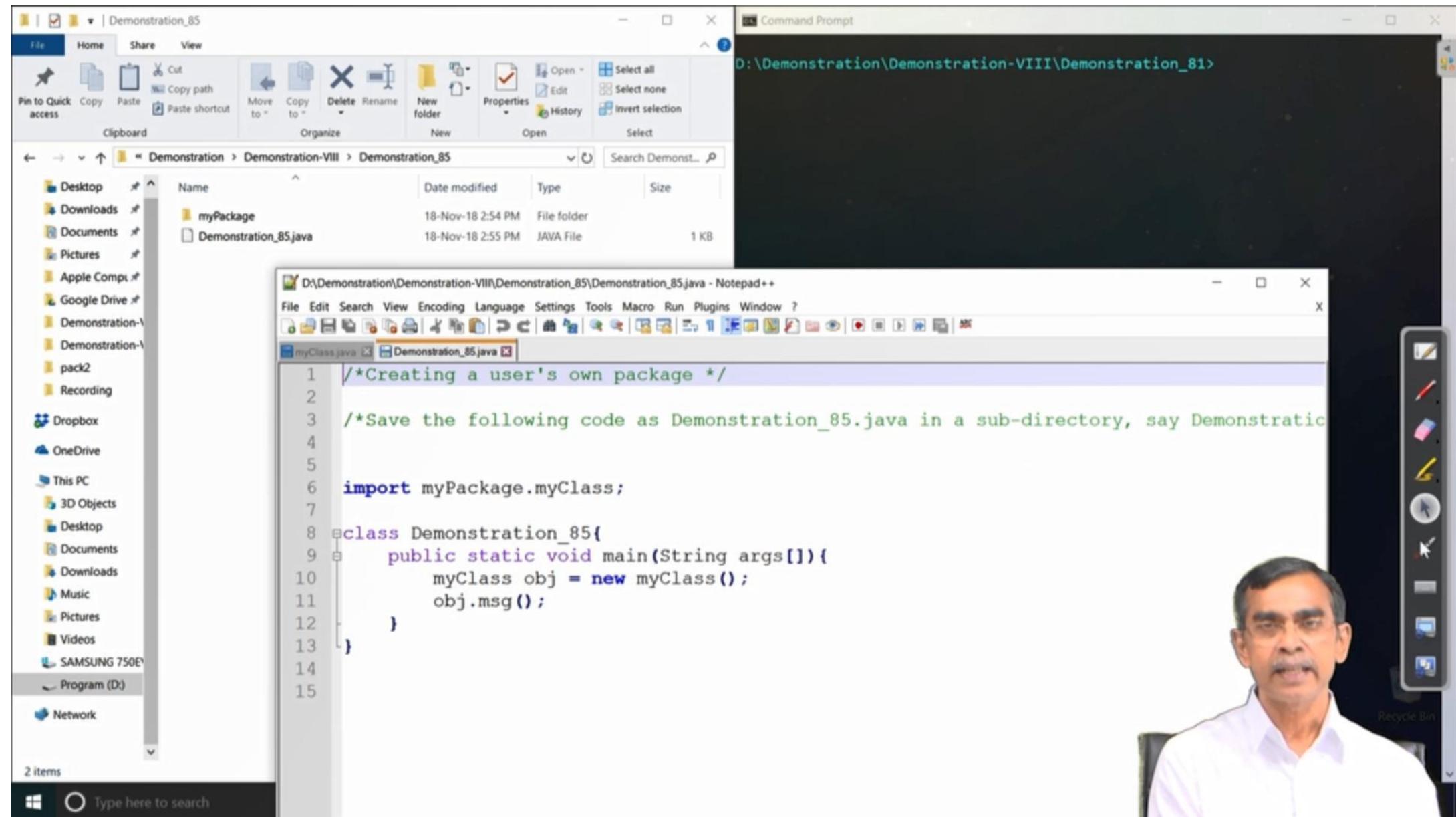
monstration_81>

Java source file length : 640 lines : 24 Ln : 1 Col : 1 Sel : 0 | 0 Windows (CR LF) UTF-8 INS

Type here to search







Demonstration_85

File Home Share View

Pin to Quick access Clipboard

Cut Copy Paste Copy path Move to " Copy to " Delete Rename New folder New Properties Open Select all Select none Invert selection Select

Desktop Downloads Documents Pictures Apple Computer Google Drive Demonstration-1 Demonstration-1 pack2 Recording Dropbox OneDrive This PC 3D Objects Desktop Documents Downloads Music Pictures Videos SAMSUNG 750E Program (D:) Network

Name Date modified Type Size

myPackage 18-Nov-18 2:54 PM File folder Demonstration_85.class 18-Nov-18 5:51 PM CLASS File 1 KB Demonstration_85.java 18-Nov-18 2:55 PM JAVA File 1 KB

Search Demonstration_85...

Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_85>javac Demonstration_85.java
D:\Demonstration\Demonstration-VIII\Demonstration_85>java Demonstration_85
Class: Hello!
```

D:\Demonstration\Demonstration-VIII\Demonstration_85>

D:\Demonstration\Demonstration-VIII\Demonstration_85\Demonstration_85.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

myClass.java Demonstration_85.java

```
1 /*Creating a user's own package */
2
3 /*Save the following code as Demonstration_85.java in a sub-directory, say Demonstration_85*/
4
5
6 import myPackage.myClass;
7
8 class Demonstration_85{
9     public static void main(String args[]){
10         myClass obj = new myClass();
11         obj.msg();
12     }
13 }
14
15
```

Type here to search

Backward 5 sec - [00:13:04 / 38%]

Demonstration_85

Clipboard

Desktop Downloads Documents Pictures Apple Computer Google Drive Demonstration-1 Demonstration-1 pack2 Recording Dropbox OneDrive This PC 3D Objects Desktop Documents Downloads Music Pictures Videos SAMSUNG 750E Program (D:) Network

Name Date modified Type Size

myPackage 18-Nov-18 2:54 PM File folder Demonstration_85.class 18-Nov-18 5:51 PM CLASS File 1 KB Demonstration_85.java 18-Nov-18 2:55 PM JAVA File 1 KB

D:\Demonstration\Demonstration-VIII\Demonstration_85>javac Demonstration_85.java

D:\Demonstration\Demonstration-VIII\Demonstration_85>java Demonstration_85

Class: Hello!

D:\Demonstration\Demonstration-VIII\Demonstration_85>

D:\Demonstration\Demonstration-VIII\Demonstration_85\Demonstration_85.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

myClass.java Demonstration_85.java

```
1 /*Creating a user's own package */
2
3 /*Save the following code as Demonstration_85.java in a sub-directory, say Demonstration_85*/
4
5
6 import myPackage.myClass;
7
8 class Demonstration_85{
9     public static void main(String args[]){
10         myClass obj = new myClass();
11         obj.msg();
12     }
13 }
14
15
```

Type here to search

Recycle Bin

Pause

myPackage

Share View

Pin to Quick access Copy Paste Copy path Move to Copy to Delete Rename New folder Properties Open Select all Select none History Invert selection

Clipboard

Organize New

Open Select

← → ↑ ↓ Demonstration-VIII > Demonstration_86 > myPackage Search myPacka... 🔎

Name	Date modified	Type	Size
myClass1.class	18-Nov-18 2:57 PM	CLASS File	1 KB
myClass1.java	18-Nov-18 2:57 PM	JAVA File	1 KB
myClass2.class	18-Nov-18 2:59 PM	CLASS File	1 KB
myClass2.java	18-Nov-18 2:59 PM	JAVA File	1 KB

D:\Command Prompt

D:\Demonstration\Demonstration-VIII\Demonstration_86>

D:\Demonstration\Demonstration-VIII\Demonstration_86\myPackage\myClass1.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_86.java myClass1.java myClass2.java

```
1 /*Creating a user's own package */
2
3 /*Save the following code as myClass1.java in a sub-directory, say myPackage. Compile t
4
5 package myPackage;
6
7 public class myClass1 {
8     public void msg(){System.out.println("myClass1: Hello! ");}
9 }
10
11
12
```

4 items 1 item selected 284 bytes

Type here to search

Recycle Bin

Demonstration_86

File Home Share View

Pin to Quick access Copy Paste Copy path Move to Copy to Delete Rename New folder Properties Open Select all Select none Invert selection Select

Clipboard

Organize New

Open Select

← → ↑ ↓ Demonstration > Demonstration-VIII > Demonstration_86 Search Demonst... 🔎

Name Date modified Type Size

Desktop myPackage 18-Nov-18 2:59 PM File folder

Downloads Demonstration_86.class 18-Nov-18 3:01 PM CLASS File 1 KB

Documents Demonstration_86.java 18-Nov-18 3:00 PM JAVA File 1 KB

Search Demonstration_86

D:\Demonstration\Demonstration-VIII\Demonstration_86>

D:\Demonstration\Demonstration-VIII\Demonstration_86\Demonstration_86.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_86.java myClass1.java myClass2.java

```
1 /*Save the following code as Demonstration_86.java in a sub-directory, say Demonstration_86*/
2
3
4 import myPackage.*;
5
6 class Demonstration_86{
7     public static void main(String args[]){
8         myClass1 obj1 = new myClass1();
9         obj1.msg();
10
11         myClass2 obj2 = new myClass2();
12         obj2.msg();
13
14     }
15
16 }
```

3 items 1 item selected 328 bytes

Type here to search



A screenshot of a Windows desktop environment showing a file explorer window, a command prompt window, and a Notepad++ code editor.

The file explorer window (left) shows the path: D:\Demonstration\Demonstration-VIII\Demonstration_88\myPackage. It lists two files: A88.class and A88.java. The A88.java file is selected.

The command prompt window (top right) shows the directory D:\Demonstration\Demonstration-VIII\Demonstration_88>.

The Notepad++ window (bottom center) displays the contents of the A88.java file:

```
1 /* Example of package by import package.classname*/
2 //Save the class as A88.java
3
4 package myPackage;
5
6 public class A88{
7     public void msg(){System.out.println("Class A88: Hello");}
8 }
9
```

The screenshot shows a Windows desktop environment with several open windows:

- File Explorer (Demonstration_88):** Shows the directory structure: Desktop, Downloads, Documents, Pictures, Apple Computer, Google Drive, Demonstration-VIII, Demonstration-1, pack2, Recording, Dropbox, OneDrive, This PC, 3D Objects, Desktop, Documents, Downloads, Music, Pictures, Videos, SAMSUNG 750E, Program (D:), and Network. The current folder is Demonstration_88, which contains myPackage (a folder), Demonstration_88.class (a CLASS File), and Demonstration_88.java (a JAVA File).
- Command Prompt:** Displays the path D:\Demonstration\Demonstration-VIII\Demonstration_88>.
- Notepad++ (Demonstration_88.java):** Contains the following Java code:

```
1 //Save the following Java program as Demonstration_88.java
2
3 import myPackage.A88;
4
5 class Demonstration_88{
6     public static void main(String args[]){
7         A88 obj = new A88();
8         obj.msg();
9     }
10}
11
```

A video overlay of a man with glasses and a mustache, wearing a white shirt, is visible on the right side of the screen. He appears to be speaking or presenting. The desktop background shows icons for File Explorer, Control Panel, Task View, and File History.



A screenshot of a Windows desktop environment showing a file explorer window, a command prompt window, and a Notepad++ code editor window.

The file explorer window (left) shows the directory structure: D:\Demonstration\Demonstration-VIII\Demonstration_89\myPackage. It contains two files: A88.class (CLASS File, 1 KB) and A88.java (JAVA File, 1 KB). The A88.java file is selected.

The command prompt window (top right) shows the path D:\Demonstration\Demonstration-VIII\Demonstration_89 and the output of a command.

The Notepad++ window (bottom center) displays the Java code for class A88:

```
1 /* Example of package by import package.classname*/
2 //Save the class as A88.java
3
4 package myPackage;
5
6 public class A88{
7     public void msg(){System.out.println("Class A88: Hello");}
8 }
9
```



Demonstration_89

File Home Share View

Pin to Quick access Copy Paste Move to Copy path Paste shortcut Copy to Delete Rename New folder Properties Open Select all Select none History Invert selection Select

← → ↑ ↓ Demonstration > Demonstration-VIII > Demonstration_89 Search Demonst... ?

Name	Date modified	Type	Size
Desktop			
Downloads			
Documents			
Pictures			
Apple Computer			
Google Drive			
Demonstration-1			
Demonstration-1			
pack2			
Recording			
Dropbox			
OneDrive			
This PC			
3D Objects			
Desktop			
Documents			
Downloads			
Music			
Pictures			
Videos			
SAMSUNG 750E			
Program (D:)			
Network			

D:\Demonstration\Demonstration-VIII\Demonstration_89>

D:\Demonstration\Demonstration-VIII\Demonstration_89\Demonstration_89.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

A88.java Demonstration_89.java

```
1 //Save the following Java program as Demonstration_89.java
2
3 //import myPackage.A88;
4
5 class Demonstration_89{
6     public static void main(String args[]){
7         myPackage.A88 obj = new myPackage.A88 ();
8                         //using the fully qualified name
9         obj.msg();
10    }
11 }
12 }
```

3 items 1 item selected 310 bytes

Type here to search

Demonstration_810

File Home Share View

Pin to Quick access Copy Paste Move to Copy path Paste shortcut Copy to Delete Rename New folder Properties Open Select all Select none History Invert selection

Clipboard

Organize New Open Select

← → ↑ ↓ Demonstration > Demonstration-VIII > Demonstration_810 Search Demonst...

Name Date modified Type Size

Desktop myPackage 18-Nov-18 3:08 PM File folder

Downloads Demonstration_810.class 18-Nov-18 3:13 PM CLASS File 1 KB

Documents Demonstration_810.java 18-Nov-18 3:15 PM JAVA File 1 KB

D:\Demonstration\Demonstration-VIII\Demonstration_810\Demonstration_810.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_810.java

```
1 // Run the following java program from Demonstration-VIII directory
2
3 import myPackage.*;
4
5 class Demonstration_810{
6     public static void main(String args[]) {
7         Balance current[] = new Balance[3];
8         current[0] = new Balance("D. Samanta", 123.23);
9         current[1] = new Balance("T. Ahmed", 157.02);
10        current[2] = new Balance("N. Sinhababu", -12.33);
11
12        for (int i = 0; i < 3; i++) {
13            current[i].show();
14        }
15    }
16
17
18 }
```

3 items 1 item selected 429 bytes

Type here to search

D:\Command Prompt

D:\Demonstration\Demonstration-VIII\Demonstration_86>

D:\Demonstration\Demonstration-VIII\Demonstration_810\myPackage\Balance.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_810.java Balance.java

```
1  /* A simple package: Utilization of package in any java application */
2
3 package myPackage;      // Adding another class into myPackage
4
5 public class Balance {
6     String name;
7     double bal;
8
9     public Balance(String n, double b) {
10        name = n;
11        bal = b;
12    }
13
14     public void show() {
15         if (bal < 0) {
16             System.out.print("Sorry! Negative balance ");
17         }
18         System.out.println(name + ": $" + bal);
19     }
20 }
21
```

Java source file length: 411 lines: 21 Ln:1 Col:1 Sel:0 | 0

Type here to search



Demonstration_810

File Home Share View

Pin to Quick access Copy Paste Copy path Move to Copy to Delete Rename New folder Open Properties Select all Select none Invert selection Select

Clipboard

Desktop Downloads Documents Pictures Apple Computer Google Drive Demonstration-1 Demonstration-1 pack2 Recording Dropbox OneDrive This PC 3D Objects Desktop Documents Downloads Music Pictures Videos SAMSUNG 750E Program (D:) Network

Name Date modified Type Size

myPackage 18-Nov-18 3:08 PM File folder Demonstration_810.class 18-Nov-18 5:58 PM CLASS File 1 KB Demonstration_810.java 18-Nov-18 3:15 PM JAVA File 1 KB

D:\Demonstration\Demonstration-VIII\Demonstration_810>java Demonstration_810

D. Samanta: \$123.23
T. Ahmed: \$157.02
Sorry! Negative balance N. Sinhababu: \$-12.33

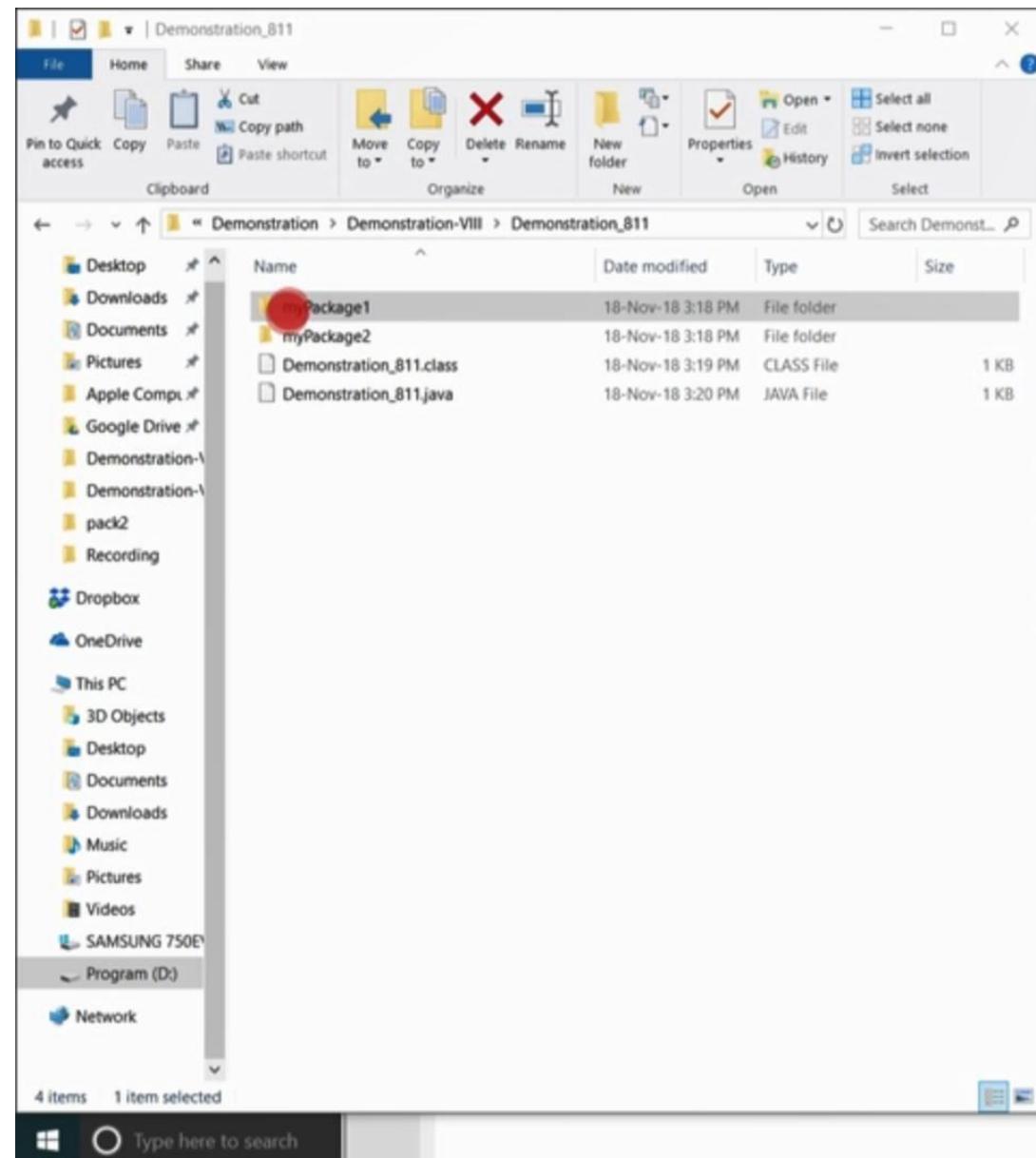
D:\Demonstration\Demonstration-VIII\Demonstration_810>

D:\Demonstration\Demonstration-VIII\Demonstration_810\Demonstration_810.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_810.java Balance.java

```
1 // Run the following java program from Demonstration-VIII directory
2
3 import myPackage.*;
4
5 class Demonstration_810{
6     public static void main(String args[]) {
7         Balance current[] = new Balance[3];
8         current[0] = new Balance("D. Samanta", 123.23);
9         current[1] = new Balance("T. Ahmed", 157.02);
10        current[2] = new Balance("N. Sinhababu", -12.33);
11
12        for (int i = 0; i < 3; i++) {
13            current[i].show();
14        }
15    }
16
17
18 }
```



A screenshot of a Command Prompt window and a code editor window.

The Command Prompt window shows the output of a Java program:

```
D:\Demonstration\Demonstration-VIII\Demonstration_811>java Demonstration_811
D. Samanta: $123.23
T. Ahmed: $157.02
Sorry! Negative balance N. Sinhababu: $-12.33
```

The code editor window shows the Java code for the 'Demonstration_811.java' file:

```
ad++
w ?
different packages and the classes are then refer
ckage myPackage1

is myPackage1 Class!! ");
```

A video overlay of a man speaking is visible in the bottom right corner of the screen.

Forward 5 sec -[00:20:59 / 61%]

D:\Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_810>java Demonstration_810
D. Samanta: $123.23
T. Ahmed: $157.02
Sorry! Negative balance N. Sinhababu: $-12.33
D:\Demonstration\Demonstration-VIII\Demonstration_810>
```

D:\Demonstration\Demonstration-VIII\Demonstration_811\myPackage2\myClass.java - Notepad++

```
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
myClass.java myClass.java

1 package myPackage2; // Creating a package myPackage2
2
3 public class myClass {
4     public void msg2() {
5         System.out.println("Hello! It is myPackage2 Class!! ");
6     }
7
8
9 }
```

2 items 1 item selected 191 bytes

Type here to search

Forward 5 sec -[00:21:23 / 63%]

D:\Demonstration\Demonstration-VIII\Demonstration_811>java Demonstration_811

D. Samanta: \$123.23
T. Ahmed: \$157.02
Sorry! Negative balance N. Sinhababu: \$-12.33

D:\Demonstration\Demonstration-VIII\Demonstration_811>

D:\Demonstration\Demonstration-VIII\Demonstration_811\Demonstration_811.java - Notepad++

```
1 import myPackage1.myClass;
2 import myPackage2.myClass;
3
4 public class Demonstration_811{
5     public static void main(String[] args){
6         myPackage1.myClass a = new myPackage1.myClass();
7         myPackage2.myClass b = new myPackage2.myClass();
8         a.msg1();
9         b.msg2();
10    }
11
12
13 }
```

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

4 items 1 item selected 315 bytes

Type here to search

Forward 5 sec -[0:22:47 / 67%]

The screenshot shows a Windows desktop environment with several open windows:

- File Explorer:** Shows the directory structure D:\Demonstration\Demonstration-VIII\Demonstration_811. It contains two package folders (myPackage1, myPackage2), a class file (Demonstration_811.class), and a Java source file (Demonstration_811.java). The Java file is selected.
- Command Prompt:** Displays the output of the javac compilation command. It shows a syntax error due to a duplicate class name 'myClass' imported from different packages.
- Notepad++:** Shows the content of the Demonstration_811.java file. The code attempts to import classes from two packages and creates instances of 'myClass' from both.

Java Code in Notepad++:

```
1 //import myPackage1.myClass;
2 //import myPackage2.myClass;
3
4 public class Demonstration_811{
5     public static void main(String[] args){
6         myPackage1.myClass a = new myPackage1.myClass();
7         myPackage2.myClass b = new myPackage2.myClass();
8         a.msg1();
9         b.msg2();
10    }
11
12
13 }
```

Forward 5 sec -[00:23:23 / 68%]

The screenshot shows a Windows desktop environment with several windows open:

- File Explorer:** Shows the directory structure D:\Demonstration\Demonstration-VIII\Demonstration_811. It contains two package folders (myPackage1, myPackage2) and two files: Demonstration_811.java and Demonstration_811.class.
- Command Prompt:** Displays the output of running javac Demonstration_811.java followed by java Demonstration_811, showing the execution of the code.
- Notepad++:** An open editor window containing the following Java code:

```
1 //import myPackage1.myClass;
2 //import myPackage2.myClass;
3
4 public class Demonstration_811{
5     public static void main(String[] args){
6         myPackage1.myClass a = new myPackage1.myClass();
7         myPackage2.myClass b = new myPackage2.myClass ();
8         a.msg1();
9         b.msg2();
10    }
11
12
13 }
```

Forward 5 sec -[00:24:23 / 71%]

D:\Demonstration\Demonstration-VIII\Demonstration_811>javac Demonstration_812.java

D:\Demonstration\Demonstration-VIII\Demonstration_811>java Demonstration_812

Hello! It is myPackage1 Class!!

Hello! It is myPackage2 Class!!

D:\Demonstration\Demonstration-VIII\Demonstration_811>

D:\Demonstration\Demonstration-VIII\Demonstration_812\Demonstration_812.java - Notepad++

```
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
D:\Demonstration\Demonstration-VIII\Demonstration_812\Demonstration_812.java Balance.java
```

1 /* Derive a sub-class in a program to be run from Demonstration-VIII directory */

2

3 import myPackage.Balance;

4

5 class Savings extends Balance{

6 String branch;

7 int customerID;

8 Savings(String n, double bal, String br, int id) {

9 super(n, bal);

10 branch = br;

11 customerID = id;

12 }

13

14 public void show() {

15 if (bal < 0) {

16 System.out.print("Sorry! Negative balance ");

17 }

18 System.out.println(name + ":" + bal + " " + branch + " " + customerID);

DA\Demonstration\Demonstration-VIII\Demonstration_812\Demonstration_812.java - Notepad

Forward 5 sec - [00:24:54 / 73%]

```
1  /* Derive a sub-class in a program to be run from Demonstration-VIII directory */
2
3  import myPackage.Balance;
4
5  class Savings extends Balance{
6      String branch;
7      int customerID;
8      Savings(String n, double bal, String br, int id) {
9          super(n, bal);
10         branch = br;
11         customerID = id;
12     }
13
14     public void show() {
15         if (bal < 0) {
16             System.out.print("Sorry! Negative balance ");
17         }
18         System.out.println(name + ": $" + bal + " " + branch + " " + customerID);
19     }
20 }
21
22
23 class Demonstration_812{
24     public static void main(String args[]) {
25         Savings current[] = new Savings[3];
26         current[0] = new Savings("D. Samanta", 123.23, "Kolkata", 555);
27         current[1] = new Savings("T. Ahmed", 157.02, "Chennai", 420);
28         current[2] = new Savings("N. Sinhababu", -12.33, "Mumbai", 999);
29     }
}
```

Java source file length: 891 lines: 35 Ln:1 Col:1 Sel:0 | 0

Type here to search



D:\Demonstration\Demonstration-VIII\Demonstration_812\Demonstration_812.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

Demonstration_812.java Balance.java

```
7     int customerID;
8     Savings(String n, double bal, String br, int id) {
9         super(n, bal);
10        branch = br;
11        customerID = id;
12    }
13
14    public void show() {
15        if (bal < 0) {
16            System.out.print("Sorry! Negative balance ");
17        }
18        System.out.println(name + ": $" + bal + " " + branch + " " + customerID);
19    }
20}
21
22
23 class Demonstration_812{
24     public static void main(String args[]) {
25         Savings current[] = new Savings[3];
26         current[0] = new Savings("D. Samanta", 123.23, "Kolkata", 555);
27         current[1] = new Savings("T. Ahmed", 157.02, "Chennai", 420);
28         current[2] = new Savings("N. Sinhababu", -12.33, "Mumbai", 999);
29
30         for (int i = 0; i < 3; i++) {
31             current[i].show();
32         }
33     }
34 }
35
```

Java source file length: 891 lines: 35 Ln:1 Col:1 Sel:0 | 0

Type here to search



Forward 5 sec -[0:26:44 / 78%]

The screenshot shows a Windows desktop environment with several open windows:

- File Explorer:** Shows the file structure at D:\Demonstration\Demonstration-VIII\Demonstration_812. It contains a folder named "myPackage" and three files: Demonstration_812.class, Demonstration_812.java, and Savings.class. Demonstration_812.java is selected.
- Command Prompt:** Displays the output of running the Java compiler and the Java application. The compiler command is "javac Demonstration_812.java". The application output shows two entries: "D. Samanta: \$123.23 Kolkata 555" and "T. Ahmed: \$157.02 Chennai 420". Both entries end with "Sorry! Negative balance N. Sinhababu: \$-12.33 Mumbai 999".
- Notepad++:** Shows the source code of Demonstration_812.java. The code defines a class Savings that extends another class (likely Customer). It includes a constructor that takes name, balance, branch, and customerID, and initializes them. It also includes a show() method that prints a message if the balance is less than 0, followed by a println statement with the customer's details.

Demonstration_813

File Home Share View

Pin to Quick access Clipboard

Cut Copy Paste Copy path Move to Copy Paste shortcut Delete Rename New folder Properties Open Select all Select none Invert selection Open Select

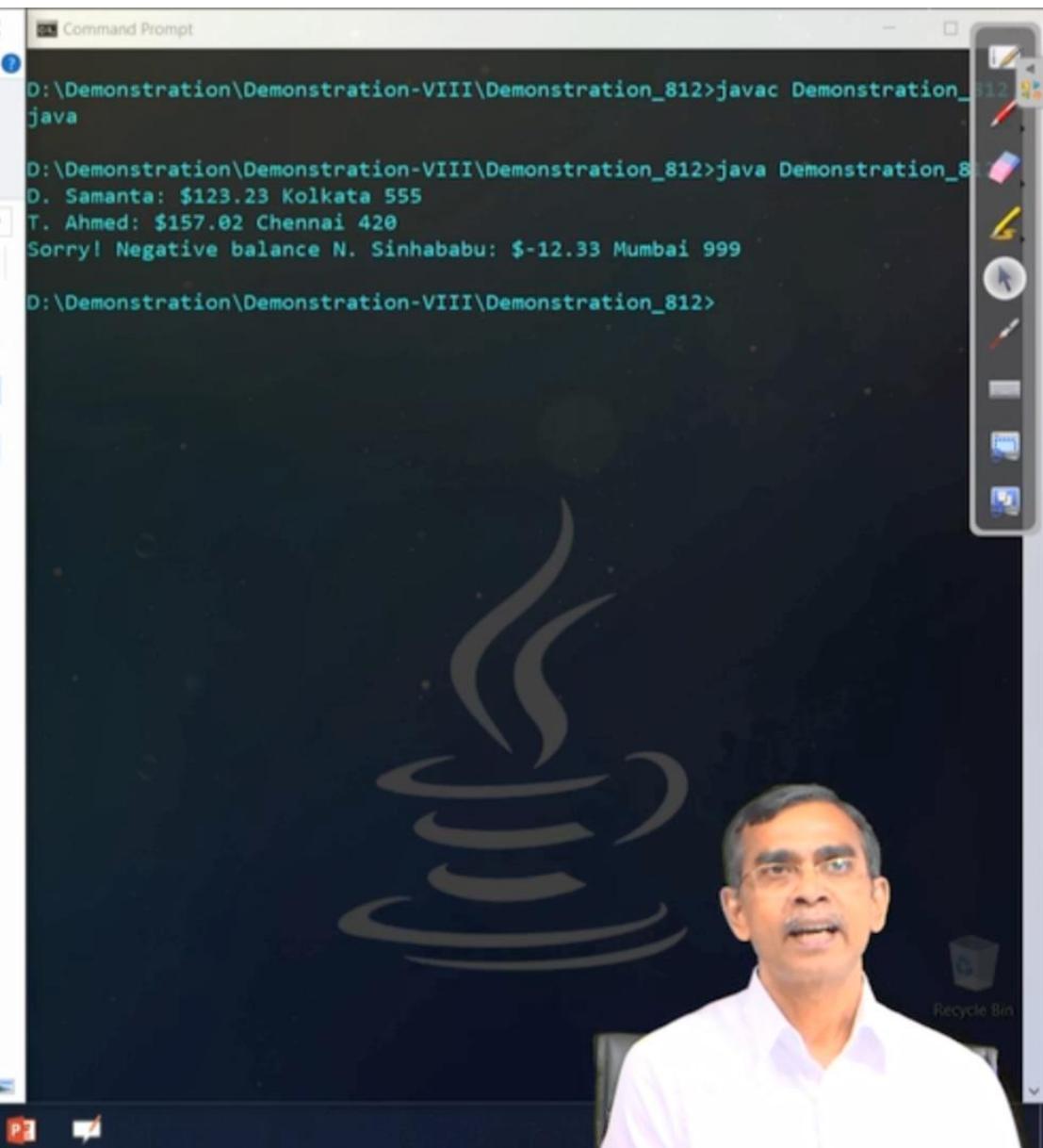
Desktop Downloads Documents Pictures Apple Computer Google Drive Demonstration-1 Demonstration-2 pack2 Recording Dropbox OneDrive This PC 3D Objects Desktop Documents Downloads Music Pictures Videos SAMSUNG 750E Program (D:) Network

4 items 1 item selected

Type here to search

Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java
D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812
D. Samanta: $123.23 Kolkata 555
T. Ahmed: $157.02 Chennai 420
Sorry! Negative balance N. Sinhababu: $-12.33 Mumbai 999
D:\Demonstration\Demonstration-VIII\Demonstration_812>
```



A screenshot of a Windows desktop showing a File Explorer window and a Command Prompt window.

File Explorer:

- Path: Demonstration-VIII > Demonstration_813 > MyPackage1
- Selected item: Y.java
- Content pane:

Name	Date modified	Type	Size
Aclass	18-Nov-18 4:02 PM	CLASS File	1 KB
Ajava	18-Nov-18 4:01 PM	JAVA File	1 KB
Xclass	18-Nov-18 4:01 PM	CLASS File	1 KB
X.java	18-Nov-18 3:41 PM	JAVA File	1 KB
Y.class	18-Nov-18 4:01 PM	CLASS File	1 KB
Y.java	18-Nov-18 4:01 PM	JAVA File	1 KB

- Status bar: 6 items 1 item selected 448 bytes

Command Prompt:

```
D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java
D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812
D. Samanta: $123.23 Kolkata 555
T. Ahmed: $157.02 Chennai 420
Sorry! Negative balance N. Sinhababu: $-12.33 Mumbai 999
D:\Demonstration\Demonstration-VIII\Demonstration_812>
```

Backward 5 sec - [00:28:50 / 85%]

MyPackage1

Clipboard

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Pin to Quick access Copy Paste Copy path Paste shortcut Move to Copy to Delete Rename New folder Open Properties Select all Edit History Invert selection Open Select

Demonstration-VIII > Demonstration_813 > MyPackage1

Name Date modified Type Size

- Aclass 18-Nov-18 4:02 PM CLASS File 1 KB
- Ajava 18-Nov-18 4:01 PM JAVA File 1 KB
- Xclass 18-Nov-18 4:01 PM CLASS File 1 KB
- X.java
- Y.class
- Y.java

D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage1\X.java - Notepad+

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

X.java

```
1 // Defining package MyPackage1
2
3 package MyPackage1;
4
5 public class X {
6     int n = 1;
7     private int p = 2;
8     protected int q = 3;
9     public int r = 4;
10    // A constructor of the class protection
11    public X() {
12        System.out.println("I am constructor from class X:");
13        System.out.println("n="+n);
14        System.out.println("p="+p);
15        System.out.println("q="+q);
16        System.out.println("r="+r);
17    }
18 }
19 //Save this as X.java in Mypackagel directory
20
```

D:\Demonstration\Demonstration-VIII\Demonstration_813>javac Demonstration_812.java

D:\Demonstration\Demonstration-VIII\Demonstration_813>java Demonstration_812

D. Samanta: \$123.23 Kolkata 555

T. Ahmed: \$157.02 Chennai 420

Sorry! Negative balance N. Sinhababu: \$-12.33 Mumbai 999

D:\Demonstration\Demonstration-VIII\Demonstration_812>



Forward 5 sec -[00:29:02 / 85%]

D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java

D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812

D. Samanta: \$123.23 Kolkata 555

T. Ahmed: \$157.02 Chennai 420

Sorry! Negative balance N. Sinhababu: \$-12.33 Mumbai 999

D:\Demonstration\Demonstration-VIII\Demonstration_812>

D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage1\Y.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

1 package MyPackage1;
2
3 public class Y extends X{
4 public Y() {
5 System.out.println("I am constructor from class Y:");
6 System.out.println("n="+n);
7 //System.out.println("p="+p); // Error p is a private
8 // member of X. Not accessible outside X.
9 System.out.println("q="+q); // Protected is accessible
10 System.out.println("r="+r); // public is accessible
11 }
12 }
13 //Save this as Y.java in Mypackagel directory
14

6 items 1 item selected 422 bytes

Type here to search



A screenshot of a Windows desktop showing a file explorer window, a command prompt window, and a Notepad window.

The file explorer window shows a directory structure under "MyPackage1" containing files Aclass, Ajava, Xclass, Xjava, Yclass, and Y.java. The Y.java file is selected.

The command prompt window shows the output of running javac and java on the Demonstration_812 class.

The Notepad window displays the Java code for class X.java, which contains a constructor that prints "I am constructor from class X:", a private variable n, a protected variable p, and a public variable q. It also contains code to print values r and s.

```
D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java
D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812
D. Samanta: $123.23 Kolkata 555
T. Ahmed: $157.02 Chennai 420
Sorry! Negative balance N. Sinhababu: $-12.33 Mumbai 999
D:\Demonstration\Demonstration-VIII\Demonstration_812>

D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage1\X.java - Notepad
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
X.java Y.java

1 package MyPackage1;
2
3 package MyPackage1;
4     public Y() {
5         System.out.println("I am constructor from class Y:");
6         int n = 10;
7         private int p = 20; // Error p is a private
8         protected int q = 30; // Not accessible outside X.
9         public int r = 40; // Protected is accessible
10        // ASytem.out.println("classe's protected is accessible");
11        public X() {
12            System.out.println("I am constructor from class X:");
13            //Save this file in MyPackage1 directory
14            System.out.println("p=" + p);
15            System.out.println("q=" + q);
16            System.out.println("r=" + r);
17        }
18    }
19 //Save this as X.java in MyPackage1 directory
20
```

Forward 5 sec -[00:30:16 / 89%]

The screenshot shows a Windows desktop environment with several open windows:

- File Explorer:** Shows a folder structure under "Demonstration-VIII > Demonstration_813 > MyPackage1". Inside, there are Java source files (X.java, Y.java) and their corresponding class files (X.class, Y.class). The X.java file is currently selected.
- Command Prompt:** Displays the output of running the Java compiler (javac) and the Java interpreter (java) on the "Demonstration_813" package. It shows the execution of the X.java and Y.java files, along with some error messages about protected and public accessibility.
- Notepad:** A window titled "D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage1\Y.java - Notepad++" displays the Java code for the Y.java file. The code defines a class Y that extends X. It contains a constructor that prints the value of n. It also contains a public method that prints the value of r. The code is annotated with comments explaining the accessibility of variables p and q.
- Speaker Icon:** A video player icon in the bottom right corner indicates that a video is playing.

Code in Y.java:

```
1 package MyPackage1;
2
3 public class Y extends X{
4     public Y() {
5         System.out.println("I am constructor from class Y:");
6         System.out.println("n="+n);
7         //System.out.println("p="+p); // Error p is a private
8         // member of X. Not accessible outside X.
9         System.out.println("q="+q); // Protected is accessible
10        System.out.println("r="+r); // public is accessible
11    }
12 }
13 //Save this as Y.java in Mypackage1 directory
14
```

Forward 5 sec -[00:31:04 / 91%]

The screenshot shows a Windows desktop environment with several windows open:

- File Explorer:** Shows a directory structure under "Demonstration-VIII > Demonstration_813 > MyPackage1". Inside, there are files: Aclass (CLASS File, 1 KB), Ajava (JAVA File, 1 KB), and Xclass (CLASS File, 1 KB). The Ajava file is selected.
- Command Prompt:** Displays the output of running javac and java commands on the "Ajava" file. It shows the classpath and the execution of the main method, which prints the balance of account holder D. Samanta.
- Notepad++:** An open editor window titled "D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage1\Ajava - Notepad++". The code is as follows:

```
//Save this as A.java in Mypackage1 directory
package MyPackage1;
import MyPackage1.X;

public class A { // class with default protection
    public A() { // default constructor with default access
        X x = new X(); // create an object of class X
        System.out.println("Same package constructor ....");
        System.out.println("n from A"+x.n);

        // Default variable is accessible in the same package
        //System.out.println("p from A"+x.p); // Error
        System.out.println("q from A"+x.q); //Protected is accessible here
        System.out.println("r from A"+x.r); // OK: public
    }
}
```

Forward 5 sec -[00:32:28 / 95%]

D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java

D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812

D. Samanta: \$123.23 Kolkata 555

T. Ahmed: \$157.02 Chennai 420

Sorry! Negative balance N. Sinhababu: \$-12.33 Mumbai 999

D:\Demonstration\Demonstration-VIII\Demonstration_812>

D:\Demonstration\Demonstration-VIII\Demonstration_813\MyPackage2\B.java - Notepad

```
//Save this as B.java in Mypackage2 directory
package MyPackage2;

import MyPackage1.*;

public class B {      // class with default protection
    public B() {        // default constructor with default access
        MyPackage1.X x = new MyPackage1.X();
        // create an object of class X
        System.out.println("I am constructor from class B of MyPackage2");
        // System.out.println("n from B of myPackage2"+x.n);
        // default variable but is not accessible in this package
        // System.out.println("p from B of myPackage2"+x.p);
        // Error
        // System.out.println("q from B of myPackage2"+x.q);
        // Error protection
        System.out.println("r from A of myPackage2"+x.r);
    }
}
```

Backward 5 sec - [00:32:49 / 96%]

Demonstration_813

Clipboard

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Pin to Quick access Copy Paste Move to Copy path Paste shortcut Copy to Delete Rename New folder Open Properties Select all Select none Invert selection Open Select

← → ↑ ↓ Demonstration > Demonstration-VIII > Demonstration_813 Search Demonst... P

Name Date modified Type Size

MyPackage1 18-Nov-18 4:02 PM File folder MyPackage2 18-Nov-18 4:02 PM File folder Demo1.class 18-Nov-18 4:02 PM CLASS File 1 KB

D:\Command Prompt

```
D:\Demonstration\Demonstration-VIII\Demonstration_812>javac Demonstration_812.java
D:\Demonstration\Demonstration-VIII\Demonstration_812>java Demonstration_812
D. Samanta: $123.23 Kolkata 555
T. Ahmed: $157.02 Chennai 420
Sorry! Negative balance N. Sinhababu: $-12.33 Mumbai 999
D:\Demonstration\Demonstration-VIII\Demonstration_812>
```

D:\Demonstration\Demonstration-VIII\Demonstration_813\Demo1.java - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

X.java Y.java Ajax Java Z.java Demo1.java

```
1 /* Finally, run the above defined classes from any working directory...*/
2
3 //This is the demo of MyPackage1
4
5 import MyPackage1.*;
6 import MyPackage2.*;
7
8 public class Demo1{
9     public static void main(String args[]){
10         X x1 = new X();
11         Y y1 = new Y();
12         A a1 = new A();
13         Z z2 = new Z();
14         B b2 = new B();
15     }
16 }
```

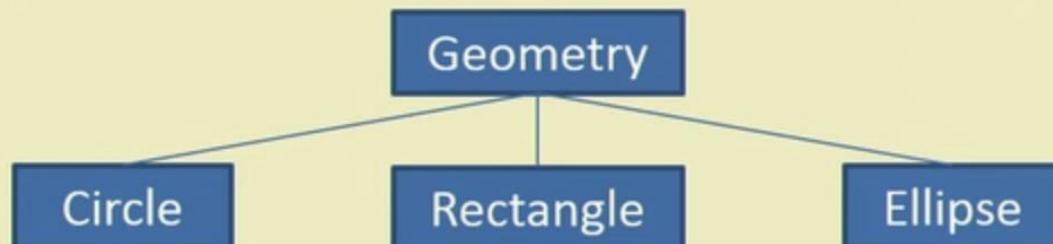
Type here to search





Abstract class concept in Java

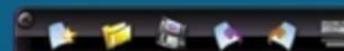
- We have discussed a number of programs with class `Circle`.
- Suppose, we want to have a number of other shapes namely `Ellipse`, `Rectangle`, `Triangle`, etc.
- All these shapes can be placed in a package, say, `myShapes`.
- Note that all these `shape classes` have basic operations, namely `area()` and `circumference()`.
- Lets see, how the above can be realized better using `abstract class concept` in Java.



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Abstract class concept in Java

```
//An abstract class and its sub class
package myShape;

public abstract class Geometry {
    static final double PI = 3.14159265358979323846;
    public abstract double area ();
    public abstract double circumference();
}
```

```
// Extending Geometry for Circle
public class Circle extends Geometry {
    public double r;
    public Circle (){
        r=1.0
    }
    public Circle (double r){
        this.r=r;
    }
    public double area() {
        return PI*r*r;
    }
    public double circumference() {
        return 2*PI*r;
    }
    public double getRadius() {
        return r;
    }
}
```



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Abstract class concept in Java

```
public class Rectangle extends Geometry {  
    protected double l,w;  
    public Rectangle() {  
        l = 0.0;  
        w = 0.0;  
    }  
  
    public Rectangle(double l,      double w) {  
        this.l = l;  
        this.w = w;  
    }  
}
```

```
    public double area() {  
        return l*w;  
    }  
    public double circumference() {  
        return 2*(l+w);  
    }  
  
    public double getwidth() {  
        return w;  
    }  
  
    public double getlength() {  
        return l;  
    }  
}
```



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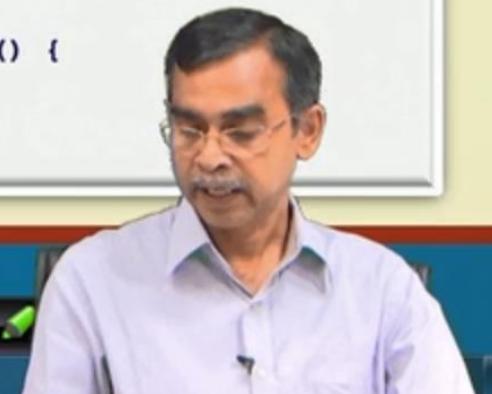




Abstract class concept in Java

```
public class Rectangle extends Geometry {  
    protected double l,w;  
    public Rectangle() {  
        l = 0.0;  
        w = 0.0;  
    }  
  
    public Rectangle(double l, double w) {  
        this.l = l;  
        this.w = w;  
    }  
}
```

```
    public double area() {  
        return l*w;  
    }  
    public double circumference() {  
        return 2*(l+w);  
    }  
  
    public double getwidth() {  
        return w;  
    }  
  
    public double getlength() {  
        return l;  
    }  
}
```



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Abstract class concept in Java

```
import myShapes.*;  
  
public class GeoDemo {  
    public static void main(String args[]) {  
  
        // use the above class definition  
        Geometry [] geoObjects = new Geometry[3]  
        // create an array to hold Geometry objects  
        geoObjects[0] = new Circle (2.0);  
        geoObjects[1] = new Rectangle (1.0,3.0);  
        geoObjects[2] = new Ellipse (4.0,2.0);  
        double totalArea = 0;  
        for (int i = 0; i < 3; i++) {  
            totalArea = totalArea + geoObjects[i].area();  
        }  
        System.out.println("Total area = " + totalArea);  
    }  
}
```



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Abstract class concept in Java

```
import myShapes.*;

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

        // use the above class definition
        Geometry [] geoObjects = new Geometry[3]
        // create an array to hold Geometry objects
        geoObjects[0] = new Circle (2.0);
        geoObjects[1] = new Rectangle (1.0,3.0);
        geoObjects[2] = new Ellipse (4.0,2.0);
        double totalArea = 0;
        for (int i = 0; i < 3; i++) {
            totalArea = totalArea + geoObjects[i].area();
        }
        System.out.println("Total area = " + totalArea);
    }
}
```

Note:

- Sub class of **Geometry** can be assigned to elements of an array of **Geometry**. No cast is required.
- One can invoke the **area()** and any method for the **Geometry** objects, even though shape does not define a body for these method, because **Geometry** declared them abstract.
- If **Geometry** did not declare the **area()** method, the code would cause compilation error.



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Few Important facts about Abstract class

- Any class with **an abstract method** is automatically abstract itself, and must be declared such.
- A class may be declared abstract **even if it has no abstract** method. This prevents it from being instantiated.
- A sub class of an abstract class can be instantiated if it overrides each of the abstract methods of its super class and provide an implementation (i.e., a method body of all of them).
- If sub class of an abstract class **does not implements all of the abstract methods**, it inherits, that sub class is itself abstract.



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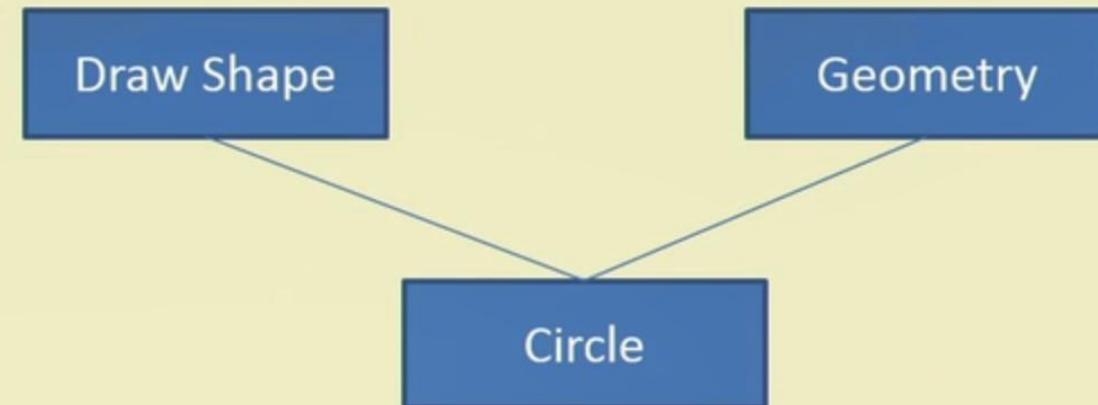


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Multiple inheritance in Java



- However, this is not possible, as Java **does not support** multiple inheritance.
- Java's solution to this problem is called **interface**.





Interface concept

An interface defines a protocol of behavior that can be implemented by any class anywhere in the class hierarchy.

An interface **defines** a set of methods but **does not implement** them.

A class that implements the interface agrees to implement all the methods defined in the interface, thereby agreeing to certain behavior.

An interface is a named collection of method definitions (without implementations).

Interfaces reserve behaviors for classes that implement them.

Methods declared in an interface are always **public** and **abstract**, though Java compiler will not complain if you omit both keywords. **Static methods cannot** be declared in the interfaces – these methods are never abstract and do not express behavior of objects.



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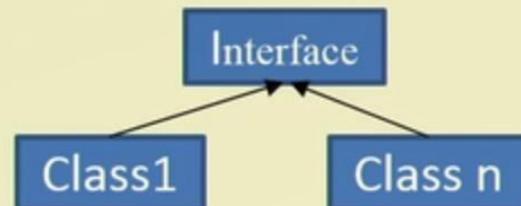
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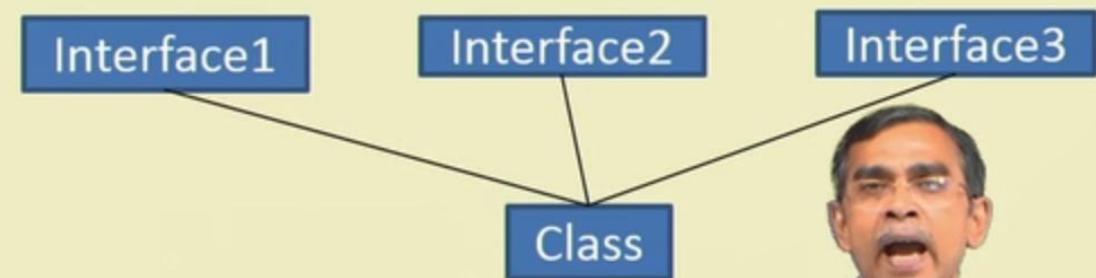


Multiple inheritance in Java

- Once an interface is defined, any number of classes can implement an interface.



- Also, one can implement any number of interfaces using a class.



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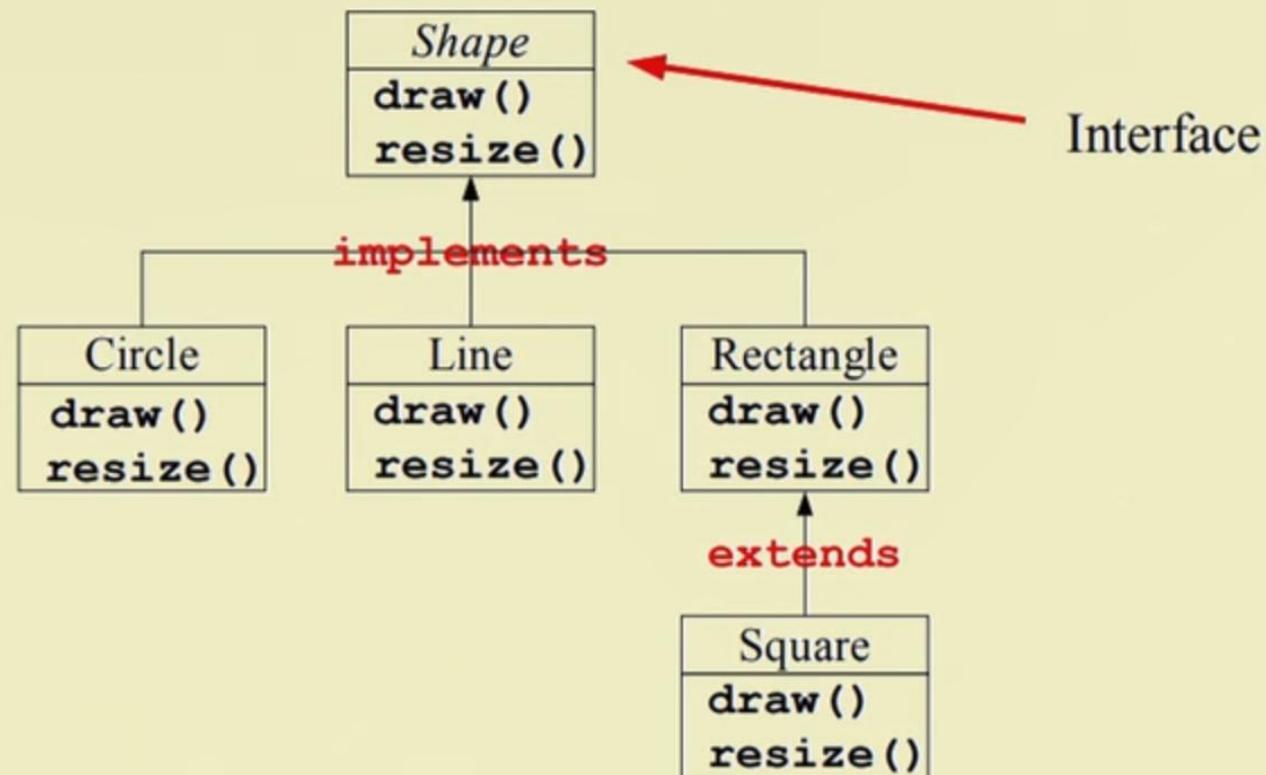


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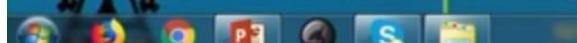
Interface : An example



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Properties of interface

Interface must be declared with the keyword **interface**.

All interface methods are implicitly **public** and **abstract**. In other words, you do not need to actually type the public or abstract modifiers in the method declaration, but method is still always public and abstract.

Because interface methods are abstract, they cannot be marked **final**.

An interfaces can extend one or more other interfaces.

All variables defined in an interface is **public**, **static** and **final**.

In other words, interfaces can declare only constants, no instance variables.

Interface methods must not be **static**.

interface types can be used polymorphically.



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Syntax for defining interface

Following is the syntax to define an interface

```
interface InterfaceName [extends name1, ..... ]  
{  
    [ Variable(s) declaration;]  
    [ Method(s) declaration;]  
}
```

Variable in an interface is declared as:

```
static final type varName = value;
```

Method in interface is declared as:

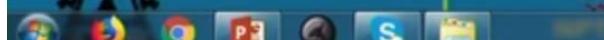
```
Return-type methodName (parameter list);
```



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Defining an interface: Example

Example:

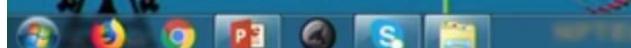
```
interface anItem
{
    static final int code = 101;
    static final String itemName = "Computer";
    void recordEntry();
}
```



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Defining an Interface: Examples

Example 1

```
interface Template
{
    static final int code = 101;
    static final String itemName = "Computer";
    void recordEntry();
}
```

Example 2

```
interface Curves extends Circle, Ellipse
{
    static final float pi = 3.142F;
    float area(int a, int b);
}
```



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Implementation of classes with interface

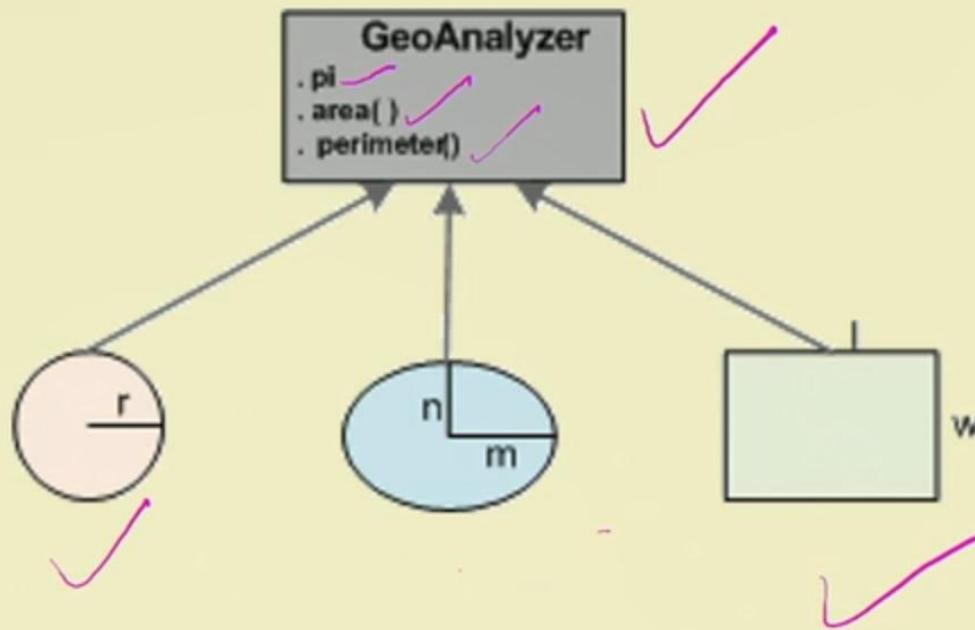
Syntax

```
class className [extends superClassClassName]
{
    [implements interfaceName1, interfaceName2, ...]
    {
        Class body
    }
}
```





Implementation of classes with interface



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Implementation of classes with interface: Example

```
interface GeoAnalyzer {
    final static float pi = 3.142F;
    float area();
    float perimeter();
}

class Circle implements GeoAnalyzer {
    float radius;
    Circle(float r) {
        radius = r;
    }
    public float area() {
        return (pi*radius*radius);
    }
    public float perimeter() {
        return (2*pi*radius);
    }
}
```



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Implementation of classes with interface: Example

```
class Ellipse implements GeoAnalyzer {
    float major;
    float minor;
    Ellipse(float m, float n) {
        major = m;
        minor = n;
    }
    public float area() {
        return(pi*major*minor);
    }
    public float perimeter() {
        return(pi*(major+minor));
    }
}
```

```
class Rectangle implements GeoAnalyzer {
    float length;
    float width;
    Rectangle(float l, float w) {
        length = l;
        width = w;
    }
    public float area() {
        return(length*width);
    }
    public float perimeter() {
        return(2*(length+width));
    }
}
```



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Implementation of classes with interface: Example

```
class Geometry
{
    static void display(float x, float y) {
        System.out.println("Area = " + x + "Perimeter = " + y);
    }
    public static void main(String args[ ]) {
        Circle c = new Circle(5.2);
        Ellipse e = new Ellipse(4.5, 3.6);
        Rectangle r = new Rectangle(6.5, 4.3);
        GeoAnalyzer geoItem;
        geoItem = c;
        display(geoItem.area(), geoItem.perimeter());
        geoItem = e;
        display(geoItem.area(), geoItem.perimeter());
        geoItem = r;
        display(geoItem.area(), geoItem.perimeter());
    }
}
```



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Implementation of classes with interface: Example

```
class Geometry ✓
{
    static void display(float x, float y) {
        System.out.println("Area = " + x + "Perimeter = " + y);
    }
    public static void main(String args[ ]) {
        Circle c = new Circle(5.2);
        Ellipse e = new Ellipse(4.5, 3.6);
        Rectangle r = new Rectangle(6.5, 4.3);
        GeoAnalyzer geoItem;
        geoItem = c;
        display(geoItem.area(), geoItem.perimeter());
        geoItem = e;
        display(geoItem.area(), geoItem.perimeter());
        geoItem = r;
        display(geoItem.area(), geoItem.perimeter());
    }
}
```



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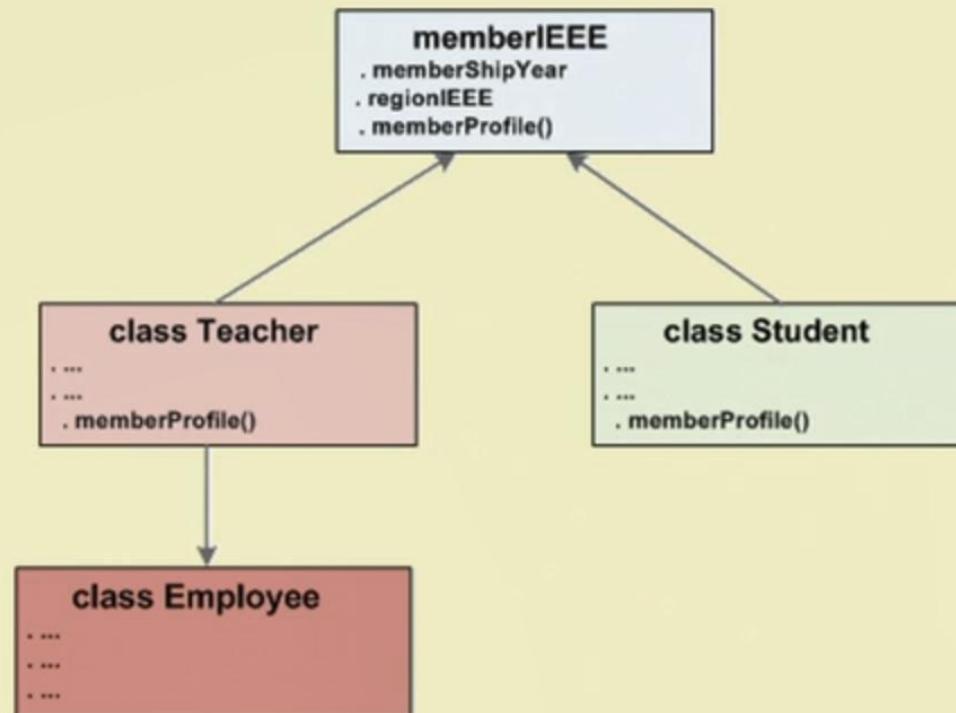


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Implementation of classes with interface: Example



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Extending interface

- Interface can inherit from other interface.
- Interface can also multiply inherits.

```
interface Constants {  
    double velOfLight = 3.0e+10;  
    String unitVelOfLight = "m/s";  
    .... .... .... ....  
}  
interface Physics {  
    void quantumLaw();  
    .... .... ....  
}
```

```
interface Chemistry extends  
Constants  
{  
    .... .... .... ....  
}  
interface lawOfPhysics extends  
Constants, Physics  
{  
    .... .... .... ....  
}
```



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