Fundamentals of Object Oriented Programming

CSN- 103

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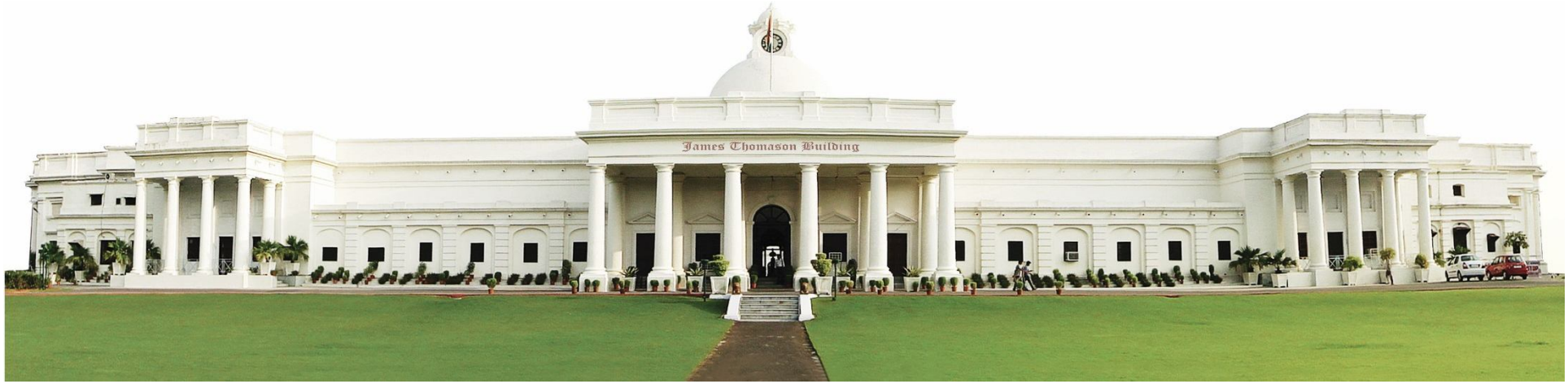


Java final class

If you make any class as final, you cannot extend it.

```
1  final class Bike{}
2
3  class Honda1 extends Bike{
4    void run(){System.out.println("running safely with 100kmph");}
5
6    public static void main(String args[]){
7    Honda1 honda= new Honda1();
8    honda.run();
9    }
10 }
```

```
Terminal
sh-4.3$ javac Honda1.java
Honda1.java:3: error: cannot inherit from final Bike
class Honda1 extends Bike{
                     ^
1 error
sh-4.3$
```

https://ideone.com/krEcRi

Is final method inherited?

- Yes, final method is inherited but you cannot override it.

```
1  class Bike{
2    final void run(){System.out.println("running...");}
3  }
4  class Honda2 extends Bike{
5     public static void main(String args[]){
6          new Honda2().run();
7          //Bike b1;
8          //b1=new Honda2();
9          //b1.run();
10    }
11 }
12
```

```
Terminal
sh-4.3$ javac Honda2.java
sh-4.3$ java Honda2
running...
sh-4.3$
```

- https://ideone.com/qulQhx

Example of blank final variable

```
class Student{
int id;
String name;
final String PAN_CARD_NUMBER;
...
}
```

Can we initialize blank final variable?

- Yes. but only in constructor

```
1  class Bike10{
2    final int speedlimit;//blank final variable
3
4    Bike10(){
5    speedlimit=70;
6    System.out.println(speedlimit);
7    }
8
9    public static void main(String args[]){
10     new Bike10();
11   }
12 }
```

```
// Bike10 b1 = new Bike10();
```

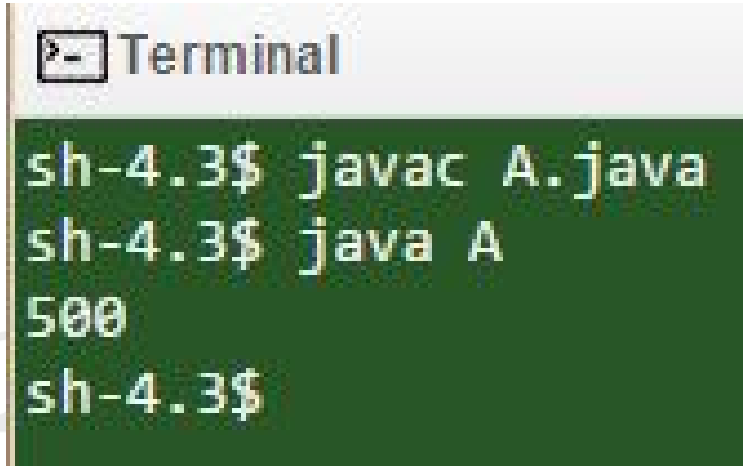
Terminal

```
sh-4.3$ javac Bike10.java
sh-4.3$ java Bike10
70
sh-4.3$
```

- https://ideone.com/HP3VCJ

static blank final variable

```
1  class A{
2    static final int data;//static blank final variable
3    static{data=500;}
4    public static void main(String args[]){
5      System.out.println(A.data);
6    }
7  }
```



https://ideone.com/2s64Ew

```
1  class Bike11{
2     int cube(final int n){
3      n=n*n*n;//can't be changed as n is final
4      return n;
5     }
6     public static void main(String args[]){
7       Bike11 b=new Bike11();
8       b.cube(5);
9    }
10  }
```

```
Terminal
sh-4.3$ javac Bike11.java
Bike11.java:3: error: final parameter n may not be assigned
   n=n*n*n;//can't be changed as n is final
   ^
1 error
sh-4.3$
```

- https://ideone.com/JTSsMK

- Packages and Interfaces

Java Package

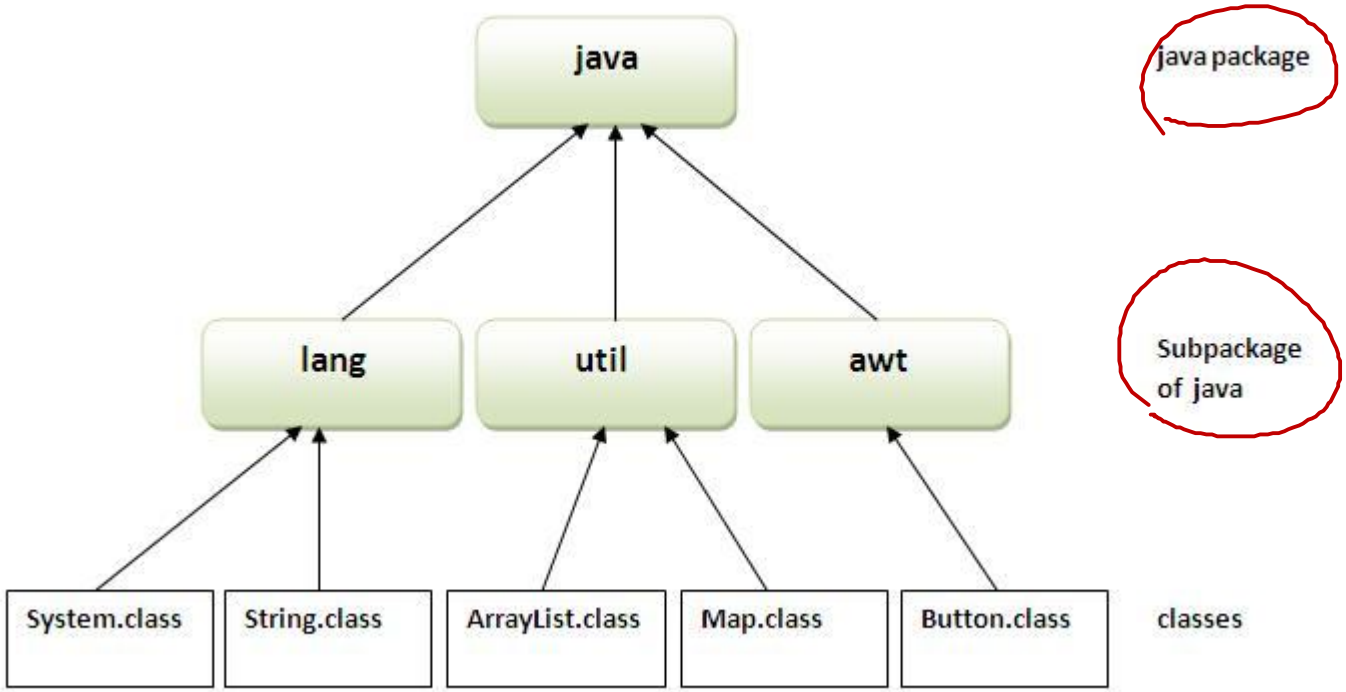
- A **java package** is a group of similar types of classes, interfaces and sub-packages.
- Package in java can be categorized in two form, built-in package and user-defined package.
- There are many built-in packages such as java, lang, awt, javax, swing, net, io, util, sql etc.
- Here, we will focus on user-defined packages.

Advantages of Java Package

1) Java package is used to categorize the classes and interfaces so that they can be easily maintained.

2) Java package provides access protection.

3) Java package removes naming collision.


java
java package
lang
util
awt
Subpackage
of java
System.class
String.class
ArrayList.class
Map.class
Button.class
classes

Simple Example of Java Package

```
1  package mypack;
2  public class Simple{
3   public static void main(String args[]){
4      System.out.println("Welcome to CSN-103, IIT Roorkee to learn the concept of package");
5     }
6  }
```

Terminal

```
sh-4.3$ javac -d . Simple.java
sh-4.3$ java mypack.Simple
Welcome to CSN-103, IIT Roorkee to learn the concept of package
sh-4.3$
```

- http://goo.gl/jBRYHT

How to compile java package

- In Terminal
- javac -d directory javafilename (in general)
- javac -d . Simple.java (particular example)
- The -d switch specifies the destination where to put the generated class file. You can use any directory name like /home (in case of Linux), d:/abc (in case of windows) etc. If you want to keep the package within the same directory, you can use . (dot).

How to run java package program

- **To Compile:** javac -d . Simple.java
- **To Run:** java mypack.Simple

- The -d is a switch that tells the compiler where to put the class file i.e. it represents destination. The . represents the current folder.

How to access package from another package?

1. There are three ways to access the package from outside the package.import package.*;

2. import package.classname;

3. fully qualified name.

1) Using packagename.*

```
1  package pack;
2  public class A{
3    public void msg(){
4        System.out.println("CSN-102, IITR");
5        System.out.println("Packages");
6    }
7  }
```

- http://goo.gl/h7Wkec

```java
package mypack;
import pack.*;

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

Terminal

```
sh-4.3$ javac -d . A.java
sh-4.3$ javac -d . B.java
sh-4.3$ java mypack.B
CSN-102, IITR
Packages
sh-4.3$
```

2) Using packagename.classname

```
1  package pack;
2  public class X{
3    public void msg(){System.out.println("Using packagename.classname");}
4  }
```

- http://goo.gl/7gH3LL

```java
package mypack;
import pack.X;

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

Terminal

```
sh-4.3$ javac -d . X.java
sh-4.3$ javac -d . Y.java
sh-4.3$ java mypack.Y
Using packagename.classname
sh-4.3$
```

3) Using fully qualified name

```
1  package pack;
2  public class A{
3    public void msg(){
4          System.out.println("CSN-103, IITR");
5          System.out.println("Using fully qualified name");
6          }
7  }
```

- **http://goo.gl/DmDkFl**

```java
package mypack;
class B{
  public static void main(String args[]){
   pack.A obj = new pack.A();//using fully qualified name
   obj.msg();
  }
}
```

Terminal

```
sh-4.3$ javac -d . A.java
sh-4.3$ javac -d . B.java
sh-4.3$ java mypack.B
CSN-103, IITR
Using fully qualified name
sh-4.3$
```

Runtime Polymorphism (Exercises)

```java
class Animal{
void eat(){System.out.println("animal is eating...");}
}

class Dog extends Animal{
void eat(){System.out.println("dog is eating...");}
}

class BabyDog extends Dog{
    void eat(){System.out.println("babydog is eating...");}
public static void main(String args[]){
Animal a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

```
Terminal
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/W11O49

```java
class Animal{
void eat(){System.out.println("animal is eating...");}
}

class Dog extends Animal{
void eat(){System.out.println("dog is eating...");}
}

class BabyDog extends Dog{
    void eat(){System.out.println("babydog is eating...");}
public static void main(String args[]){
Dog a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

Terminal

```
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/fXIqDy

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class Animal{
void eat(){System.out.println("animal is eating...");}
}

class Dog extends Animal{
void eat(){System.out.println("dog is eating...");}
}

class BabyDog extends Dog{
    void eat(){System.out.println("babydog is eating...");}
public static void main(String args[]){
BabyDog a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

```
Terminal
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/Ki8k5m

```
1  class Animal{
2  //void eat(){System.out.println("animal is eating...");}
3  }
4
5  class Dog extends Animal{
6  void eat(){System.out.println("dog is eating...");}
7  }
8
9  class BabyDog extends Dog{
10     void eat(){System.out.println("babydog is eating...");}
11 public static void main(String args[]){
12 BabyDog a=new BabyDog();
13 System.out.println(a);
14 a.eat();
15 }
16 }
```

Terminal

```
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/8FWqzN

```
1  class Animal{
2  //void eat(){System.out.println("animal is eating...");}
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4
5  class Dog extends Animal{
6  void eat(){System.out.println("dog is eating...");}
7  }
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10 //  void eat(){System.out.println("babydog is eating...");}
11 public static void main(String args[]){
12 BabyDog a=new BabyDog();
13 System.out.println(a);
14 a.eat();
15 }
16 }
```

```
Terminal
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
dog is eating...
sh-4.3$
```

- https://ideone.com/QigR3m

```
1  class Animal{
2  //void eat(){System.out.println("animal is eating...");}
3  }
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9  class BabyDog extends Dog{
10 void eat(){System.out.println("babydog is eating...");}
11 public static void main(String args[]){
12 BabyDog a=new BabyDog();
13 System.out.println(a);
14 a.eat();
15 }
16 }
```

Terminal

```
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/1icrQJ

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public static void main(String args[]){
BabyDog a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

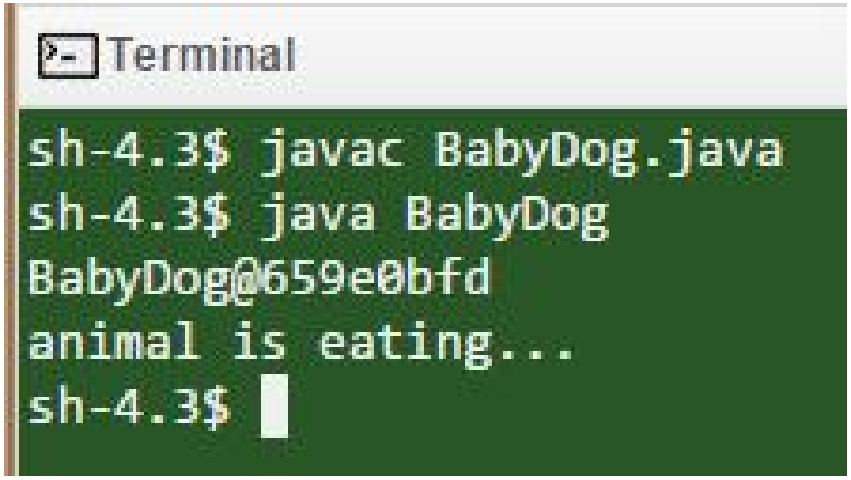

- https://ideone.com/TrWjed

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Dog a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

```
Terminal
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
animal is eating...
sh-4.3$
```

- https://ideone.com/9lnYWv

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System.out.println(a);
a.eat();
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```

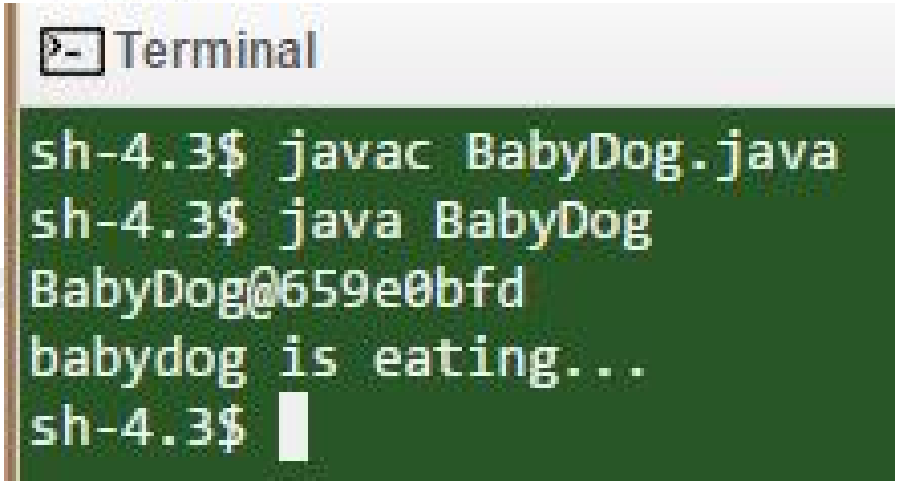

- https://ideone.com/Ksb1d8

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class Animal{
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class BabyDog extends Dog{
void eat(){System.out.println("babydog is eating...");}
public static void main(String args[]){
Animal a=new BabyDog();
System.out.println(a);
a.eat();
}
}
```

Terminal

```
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
BabyDog@659e0bfd
babydog is eating...
sh-4.3$
```

- https://ideone.com/Jbi7Rz

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public static void main(String args[]){
Animal a=new Dog();
System.out.println(a);
a.eat();
}
}
```

Terminal

```
sh-4.3$ javac BabyDog.java
sh-4.3$ java BabyDog
Dog@659e0bfd
animal is eating...
sh-4.3$
```

- https://ideone.com/DNXW75

```java
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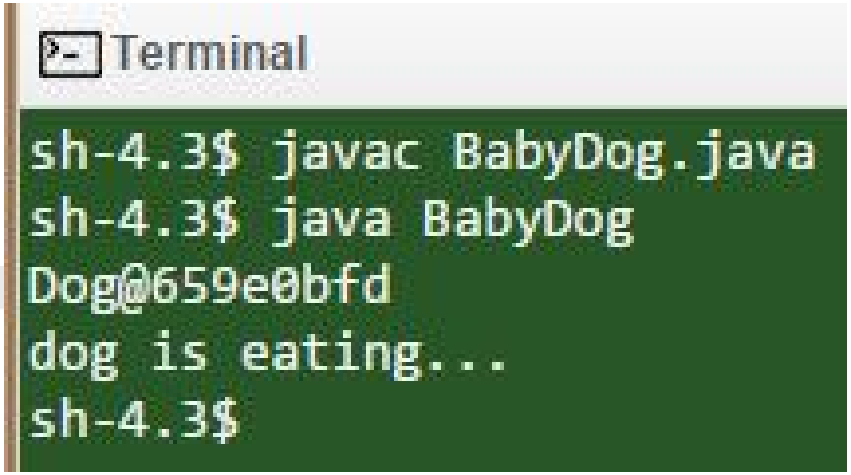

- https://ideone.com/IpTPFk


Happy Dussehra!