Chapter ✱ INHERITANCE ✱

P55

```
1) Class A
{
    static int j=90;
    int i=12;
    double d=8.3;
}
Class B
{
    static int j=2348;
    int k=67;
    float f = 23.43f;
}
Class Run1
{
    psvm ( )
    {
     Sop("Program starts...");
     A a1 = new A();
     Sop ("i="+a1.i);
     Sop ("d=" + a1.d);
     Sop ("j=" + a1.j);
     Sop ("----------");
     B b1 = new B();
     Sop ("k=" + b1.k);
     Sop ("f=" + b1.f);
     Sop ("j=" + b1.j);
     Sop ("Program ends...")
    }
}
```

O/P:

```
Program starts...
i=12
d=8.3
j=90
--------
```

1✱) Inheriting a member of one class to another class is known as Inheritance

2✱) The class from where members are inherited are known as Super class / parent class / base class.

3✱) The class to which members are inherited are known as Sub class / child class / derived class.

4✱) A sub class can inherit a super class by using 'extends' keyword

Syntax :-

```
Class SubClassName extends SuperClass
{
    ____
    ____
    ____
}
```

5✱) The inheritance always happens from super class to SubClass.

6✱) Only non-static members of SuperClass are inherited to Sub Class.

7✱) The static member of SuperClass will not be inherited to SubClass because :-

NOTE:

- ✱ The static members will be loaded into static pool at the time of Classloading.
- ✱ Static members will not be loaded into the Object.

O/p continued...

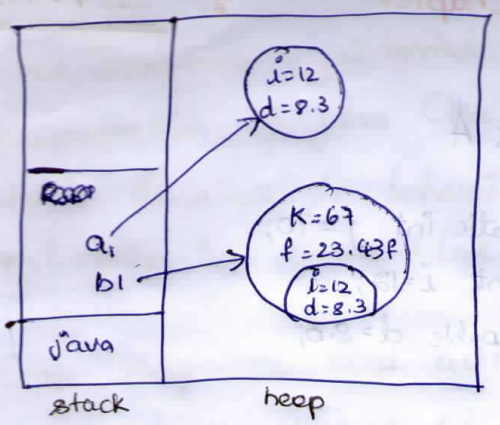
```
k=67
f=23.4
j=2348
Program ends...
```

2) Class A

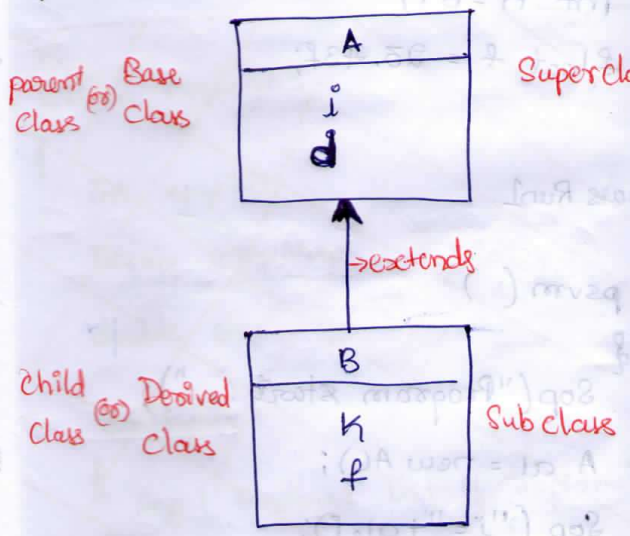
```
{
    int i=12;
    double d=8.3;
}

Class B extends A
{
    int K=67;
    float f=23.43f;
}

Class Run1
{
    psvm ( )
    {
    Sop("Program starts...");
    A a1 = new A();
    Sop("i=" + a1.i);
    Sop("d=" + a1.d);
    Sop("----------");
    B b1 = new B();
    Sop("K=" + b1.K);
    Sop("f=" + b1.f);
    Sop("i=" + b1.i);
    Sop("d=" + b1.d);
    Sop("Program ends...");
    }
}
```

O/p: Program starts...
i = 12
d = 8.3

K = 67
f = 23.43
i = 12
d = 8.3
Program ends...



9*) Pictorial Representation of Inheritance



3) P57

```
class C
{
  int i=78;
}
Class D extends C
{
  double d=12.34;
}
Class E extends D
{
  float f = 324.0f;
}

Class Run2
{
   psvm ( )
   {
     Sop ("Program starts...");
     D d1 = new D( );
     Sop ("i = " + d1.i);
     Sop ("d = " + d1.d);
     Sop ("_ _ _ _ _ _ _ _ _");
     E e1 = new E ( );
     Sop ("i = " + e1.i);
     Sop ("d = " + e1.d);
     Sop ("f = " + e1.f);
     Sop ("program ends...");
   }
}
```

O/P:

```
Program starts...
i = 78
d = 12.34
_ _ _ _ _ _ _ _ _ _
i = 78
d = 12.34
f = 324.0f
Program ends...
```

Assignment 30-01-2013

P58

```
class Employee
{
    int empID;
    String empName;
    double empSalary;
    Employee()
    {
        Sop("running default constructor");
        this.empID = 000;
        this.empName = "noname";
        this.empSalary = 0.0;
    }
    Employee(int empID, String empName, double empSalary)
    {
        Sop("running 3 arg constructor");
        this.empID = empID;
        this.empName = empName;
        this.empSalary = empSalary;
    }
    int getEmpID()
    {
        return this.empID;
    }
    String getEmpName()
    {
        return this.empName;
    }
    double getEmpSalary()
    {
        return this.empSalary;
    }
```

O/P:

```
Program starts...
running default constructor
Emp ID : 12012
Emp Name : Ramesh
Emp Salary : 23455.87
Program ends...
```

```
void setempID (int empID)
{
    this.empID = empID;
}
void setempSalary(double empSalary)
{
    this.empSalary = empSalary;
}
void setEmpName(String empName)
{
    this.empName = empName;
}
Class CreateEmployee
{
    psvm()
    {
        Sop("Program starts...");
        Employee empl = new Employee(12012, "Ramesh", 23455.87);
        Sop("Emp ID:" + empl.getEmpID());
        Sop("Emp Name:" + empl.getEmpName());
        Sop("Emp Salary:" + empl.getEmpSalary());
        Sop("Program ends...");
    }
}
```

31-01-2013 Thursday

Constructor Chain

4) P59

```
class F
{
    F()
    {
      Sop("running F() constructor...");
    }
}
class Gr extends F
{
    Gr()
    { super();
      Sop("running Gr() constructor...");
    }
}
Class H extends Gr
{
    H()
    { super();
      Sop("running H() constructor...");
    }
}
Class Run3
{
  psvm()
  { Sop("Program starts...");
    H h1 = new H();
    Sop("Program ends...");
  }
}
```

O/P: Program starts...
Running F() constructor...
Running Gr() constructor...
Running H() constructor...
Program ends...

1*) In inheritance, when an object of sub class is created, the constructor of sub class calls the constructor of super class.

2*) The super class constructor calls its super class constructor this is known as Constructor Chain

3*) Inheritance happens only if the constructor chain happens

4*) The chain of constructor is implicitly done by compiler by using a statement called super() statement.
The super() statement calls the constructor of super class

5*) Whenever compiler makes an implicit call to super class, it always calls to default constructor of super class.

6*) If super class doesn't have default constructor then sub class constructor should explicitly calls parametrized constructor of Super Class.

7*) The Super() statement has to be written in the first line of constructor body.
Inside constructor body

5) P60

```
class F
{
   F()
    {
      super(); //calls
      Sop("running F() constructor...");
    }
}
class Gr extends F
{
    Gr(int a)
    {
      Sop("running Gr() constructor...");
    }
}
class  H extends Gr
{
   H()
    {
      super(12);
      Sop("running H() constructor...");
    }
}

Class Run3
{
    psvm ( )
     {
       Sop ("Program starts...");
       H h1 = new H ( );
       Sop ("Program ends...");
     }
}
```

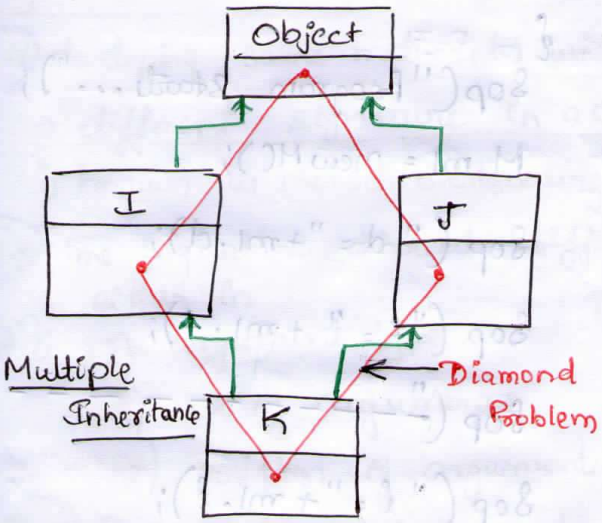
O/P: Program starts...
running F() constructor...
running Gr() constructor...
running H() constructor
Program ends.

we cannot write both this() & super() statement. either one of statement should be written

8*) Every java class should inherit from Object class.

Object class is supermost class in java.

9*) Diamond Problem



Example

```
Class I
{
}
class J
{
}
class K extends I, J
{   //error, multiple inheritance
    not supposted in java using Class
}
```

6) P61

```
class L
{
    static int i=12;
           double d=23.45;
}
class M extends L
{
    float f=12.34f;
}
class Run5
{
    psvm( )
    {
     Sop("Program starts...");
     M m1 = new M();
     Sop ("d = "+m1.d);
     Sop ("f = " +m1.f);
     Sop ("----------");
     Sop ("i = "+m1.i);
     Sop ("Program ends...");
    }
}
```

O/P:

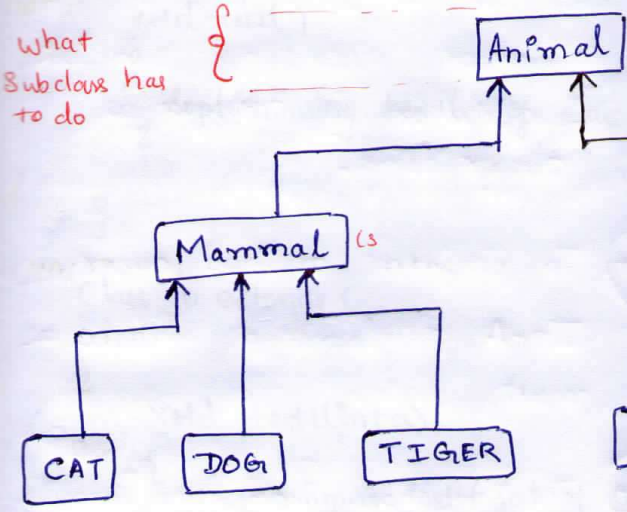
10) Inheriting more than one class members at a time is known as multiple inheritance.

Java doesn't support multiple inheritance using class because subclass constructor cannot make call to more than one super class. Also Object class member cannot be inherited to single subclass in more than one path.

01-02-2013 | Friday

* method - behaviour
* variables - fields

what Subclass has to do { _____ _____



* Subclass is a type of Superclass
* Cat Is-A type of Animal
* Cat Is-A type of Mammal
* Snake Is-A type of Reptile
* Snake Is A type of Animal

P68

METHODS | OverLoading

7)

```
class A
{
3*  void test1()
    {
      Sop("running test1() method of class A");
    }

    void test1(int a)
    {
      Sop("running test1(int) method of Class A");
    }
    Void test1(double a)
    {
      Sop("running test1(double) method of Class A");
    }
14* }
}

Class Run1
{
  psvm()
  {
    Sop("Program starts...");
```

1 *) developing same methods() with a different signature in a class is known as Method overloading.

2 *) The signature should differ either in
- 2.1) argument type
- 2.2) No of arguments
- 2.3) position of arguments.

3 *) Both static methods and non-static methods of a class can be overloaded in the class.

4 *) A super class method can be overloaded in sub class

5 *) A method overloading should be done whenever same operation has to implemented based on arguments.

6 *) The jvm executes the method based on arguments value.

```
A a1 = new A();
a1.test1();
a1.test1(12);
a1.test1(12.34);
Sop("Program ends...");
```

O/P:

```
Program starts...
running test1() method of class A
running test1(int) method of ClassA
running test1(double) method of ClassA
Program ends...
```

---

8) Class B P63

```
{
  static void test1()
  {
    Sop("running test1() method of classA");
  }
  static void test1(int a)
  {
    Sop("running test1(int) method of ClassA");
  }
  static void test1(double a)
  {
    Sop("running test1(double) method of ClassA");
  }
```

15*

26 *

9) P64

```
Class C
{
   void test1()
   {
     Sop("running test1() of class C");
   }
}
Class D extends C
{
    void test1(int a)
    {
      Sop("running test1(int of Class D");
    }
}

Class Run3
{
    psvm()
   {
    Sop ("Program starts...");
    D d1 = new D();
    d1. test1(); // inherited member
    d1. test1(123); // derived member
    Sop("Program ends...");
    }
}
```

O/P:

```
Program starts...
running test1() of class C...
running test1(int) of class D...
Program ends...
```

10)

```
class C
{ //overridden method
    void test1()
    {
      Sop("running test1() of class C");
    }
}

class D extends C
{
  //overridded method
   void test1()
   {
     Sop("running test1() of class D");
   }

class Run3
{
    psvm()
    {
      Sop("Program start ...");

      D d1 = new D();
      d1.test1();

      Sop ("Program ends ...");
    }
}
```

O/P:

```
Program starts ...
running test1() of class D
Program ends ...
```

1.* Inheriting the behavior of superclass and changing the behavior according subclass specification is known as overriding.

2.* To perform method overriding Is-A relationship should be must.

3.* The method signature in the subclass should be same as superclass type.

4.* Sub class should provide a diff implementation.

5.* whenever an object of subclass is created for overridded method sub class implementation will be available.

6.* We cannot override static methods of a super class because it will not inherited to sub class object.

7.* The super class method which is overrided in subclass is called as overridden method the same method in a sub class is called as overridded method.

04-02-2013 | MONDAY

abstract classes

ABSTRACT METHOD

P66

```
abstract class A
{
  static void sample1()
  {  // concrete method
   Sop("running sample1()...");
  }
  abstract void sample2();//abstract method
}
class Run1
{
  perm(String[] args)
  {
   Sop("program starts...");
   A.sample1();
   Sop("program ends...");
  }
}
```

O/P:
Program starts...
running sample1()
Program ends...

Abstract Classes / Method

1*) A method developed with signature & body is known as concrete method (or) Complete method.

2*) Any method developed without body is known as abstract method.

3*) The abstract method should be declared with a keyword abstract.

4*) If a class contains atleast one abstract method, then the class should be declared as abstract.

5*) Inside an abstract class, we can develop both abstract & concrete method.

6*) If a class is declared as abstract it's not mandatory to develop abstract method.

7*) We cannot create an instance of abstract class, hence we cannot access non-static members of abstract class.

8*) The static members of an abstract class can be referred using class name.

9*) We can develop empty abstract class.

P67

2)

```
abstract Class B
{
    abstract void sample1();
}
class C extends B
{
    void sample1()
    {
        Sop("Sample1() implemented in class C");
    }
}
class Run2
{
    psvm (String[] args)
    {
        Sop("Program starts...");
        C c1 = new C();
        c1.sample1();
        Sop("Program ends...");
    }
}
```

O/p:
Program starts...
Sample1() implemented in class C
Program ends...

10*) A subclass inheriting an abstract class should override all the abstract methods of the abstract class, otherwise the subclass should be declared as abstract.

11*) An abstract method of an abstract class, can get the body in any of the Sub class level.

3) P68

```
abstract class D
{
   abstract void demo1();
   abstract void demo2();
}
abstract class E extends D
{
   void demo1()
   { Sop("demo1() implemented in class E");
   }
}
class F extends E
{
      void demo2()
      {
        Sop("demo2() implemented in class F");
      }
}
class Run3
{
   psvm (String[] args)
   {
    Sop ("Program starts...");
      F f1 = new F();
      f1. demo1();
      f2. demo2();
      Sop ("Program ends...");
   }
}
```

O/P: Program starts...
demo1() implemented in class E
demo2() implemented in class F
Program ends...

4) abstract class G1

```
{
    void sample1()
    {
     Sop("sample1() implemented in class G1");
    }
}
class H extends G1
{
   H()
   {
     Sop ("running H() constouctor");
   }
}
Class Run4
{
   psvm(String[] args)
   {
     Sop ("Program starts...");
     H h1 = new H();
     h1.sample1();
     Sop ("Program ends...");
   }
}
```

O/P: Program starts...

running H() constructor
Sample1() implemented in class G1
Program ends...

05-02-2013 | TUESDAY

P70

5)
```
class I
{
  final void test1()
  {
    sop("running test1() of class I");
  }
}
class J extends I
{
  //error, cannot override final methods of super class
  void test1()
  {
    sop("running test1() of class J");
  }
}
```

6) final abstract class I
// error, abstact final illegal combination

7)
```
abstract class I
{
  final abstract void test1();
  {
```

8)
```
abstract class I
{
  abstract static void test1();
}
```

9)
```
final class I
{
}
Class J esctends I
```

12*) A method can be declared as final, final methods behavior cannot be changed, means final methods cannot be overrided, final methods can be inherited to sub class from super class but not overrided.

13*) A class can be declared as final, such classes cannot have sub class.

14*) We concreate an instance of final class & execute the members of final class.

NOTE:

15*) final abstract combination is illegal because as per abstract the method() should be overridded in subclass and as per final method() should not be overridded.

16*) abstract static is an illegal combination because static methods cannot be overridded.