Object Oriented Programming
CS F213

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Inheritance

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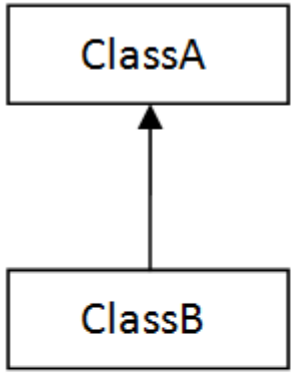
What is Inheritance?

- An Object acquires all the properties and behavior of a parent
- New classes can be built upon the existing classes
- Methods and fields of the parent class can be reused
- Runtime polymorphism can be achieved

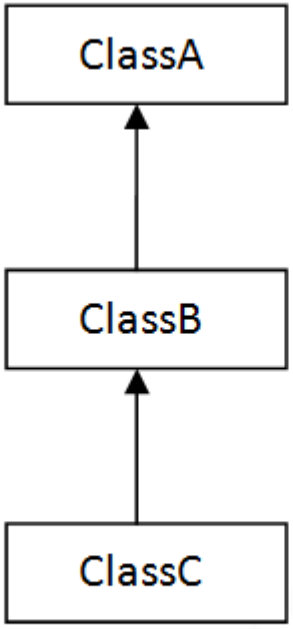
Rules

- All data members of the superclass are also data members of the subclass. Similarly, the methods of the superclass are also the methods of the subclass.
- The private members of the superclass cannot be accessed by the members of the subclass directly.
- The subclass can directly access the public members of the superclass.

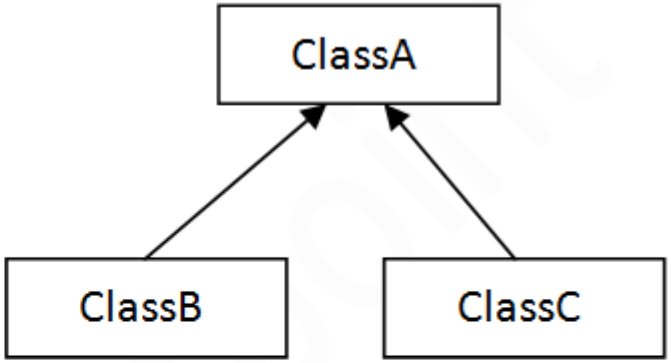
Types of Inheritance



1) Single

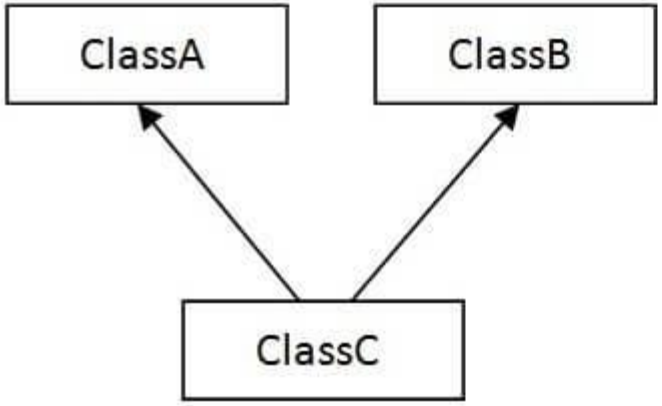


2) Multilevel

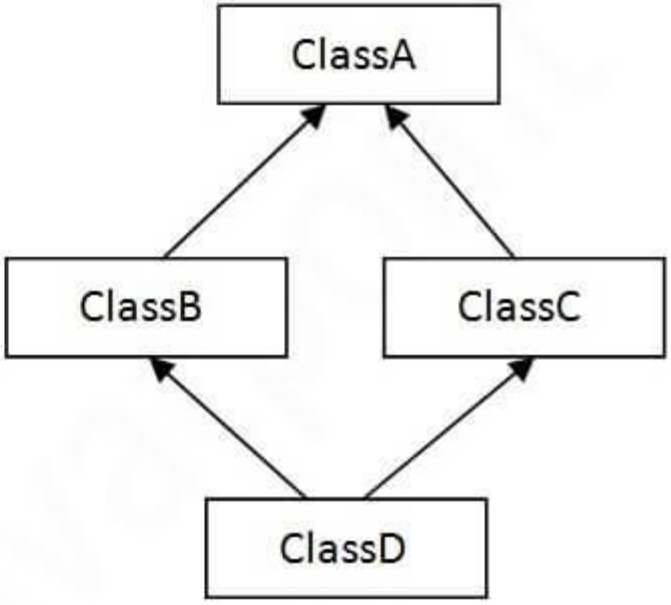


3) Hierarchical

Types of Inheritance



4) Multiple



5) Hybrid

Why is Multiple Inheritance not Supported?


```
class A{
void msg(){System.out.println("Hello");}
}
class B{
void msg(){System.out.println("Welcome");}
}
class C extends A,B{//suppose if it were

 Public Static void main(String args[]){
   C obj=new C();
   obj.msg();       //Now which msg() method would be invoked?
}
}
```

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‘Super’ Keyword

Immediate parent class instance variable

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```
class Animal{
String color="white";
}
class Dog extends Animal{
String color="black";
void printColor(){
System.out.println(color);//prints color of Dog class
System.out.println(super.color);//prints color of Animal class
}
}
class TestSuper1{
public static void main(String args[]){
Dog d=new Dog();
d.printColor();
}}
```

Invoke parent class method

```
class Animal{
void eat(){System.out.println("eating...");}
}
class Dog extends Animal{
void eat(){System.out.println("eating bread...");}
void bark(){System.out.println("barking...");}
void work(){
super.eat();
bark();
}
}
class TestSuper2{
public static void main(String args[]){
Dog d=new Dog();
d.work();
}}
```

Invoke parent class constructor

```
class Animal{
Animal(){System.out.println("animal is created");}
}
class Dog extends Animal{
Dog(){
super();
System.out.println("dog is created");
}
}
class TestSuper3{
public static void main(String args[]){
Dog d=new Dog();
}}
```

Multi Level Inheritance

```
class Car{
  public Car()     {
    System.out.println("Class Car");     }
  public void vehicleType()     {
    System.out.println("Vehicle Type:
    Car");       }   }
class Maruti extends Car{
  public Maruti()     {
    System.out.println("Class Maruti");  }
  public void brand()     {
    System.out.println("Brand: Maruti");}
  public void speed()     {
    System.out.println("Max: 90Kmph");
  }  }
```

```
public class Maruti800 extends Maruti{
  public Maruti800()      {
    System.out.println("Maruti Model:
    800");      }
  public void speed()     {
    System.out.println("Max: 80Kmph");}

public static void main(String args[])
  {
     Maruti800 obj=new Maruti800();
     obj.vehicleType();
     obj.brand();
     obj.speed();
  }
}
```

Multi Level Inheritance

```
class Grandparent {
    public void Print() {
        System.out.println("Grandparent's
      Print()");
    }
}

class Parent extends Grandparent {
    public void Print() {
        System.out.println("Parent's
      Print()");
    }
}
```

```
class Child extends Parent {
    public void Print() {
        super.super.Print();   //Error
        System.out.println("Child's
      Print()");
    }
}

public class Main {
    public static void main(String[] args) {
        Child c = new Child();
        c.Print();
    }
}
```

Multi Level Inheritance

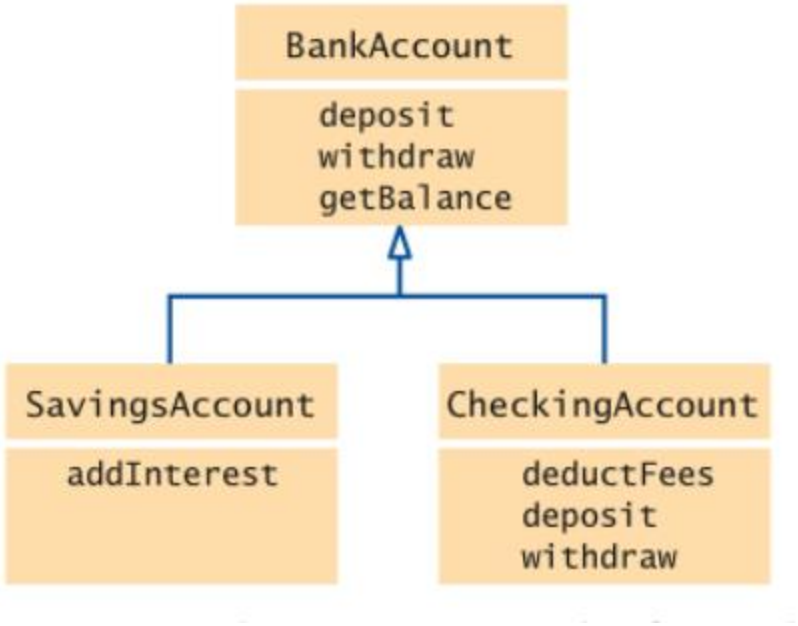
```
class Grandparent {
    public void Print() {
        System.out.println("Grandparent's
      Print()");
    }
}

class Parent extends Grandparent {
    public void Print() {
      super.Print();
       System.out.println("Parent's
      Print()");
    }
}
```

```
class Child extends Parent {
    public void Print() {
        super.Print();
        System.out.println("Child's
       Print()");
    }
}

public class Main {
    public static void main(String[] args) {
        Child c = new Child();
        c.Print();
    }
}
```

Bank Inheritance Scenario



Single Inheritance - Example

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```
class BankAccount{
private int acc;
private String name;
private float amount;

BankAccount(int acc,String name,float amt)
{
this.acc = acc;
this.name = name;
this.amount = amt;   }

void setAcc(int acc)   {
this.acc = acc;    }

void setName(String name)  {
this.name = name;   }

float getBalance(){
return amount;}

void deposit(float amount)   {
this.amount = this.amount+amount; }

void withdraw(float amount)  {
if (this.amount < amount)
System.out.println("Insufficient
     Funds. Withdrawal Failed");
else
this.amount=this.amount-amount;  }
}
```

Single Inheritance - Example

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```
class SavingsAccount extends BankAccount
{
private float interest;

SavingsAccount(int acc,String name,float amt,float interest)   {
super(acc,name,amt);
this.interest = interest;    }

void addInterest()    {
float interest = getBalance()*this.interest /100;
deposit(interest);
}
}
```

Single Inheritance - Example

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

SavingsAccount sa= new SavingsAccount(111,"Ankit",5000,9);

System.out.println("Initial: "+sa.getBalance());

sa.deposit(1000);
System.out.println("After Deposit: " + sa.getBalance());

sa.addInterest();
System.out.println("Deposit+Interest: " + sa.getBalance());

sa.withdraw(6000);
System.out.println("After Withdraw: " + sa.getBalance());    }}
```