Java Object Oriented

Java - Inheritance

Inheritance can be defined as the process where one class acquires the properties (methods and fields) of another.

## extends Keyword

**extends** is the keyword used to inherit the properties of a class.

class Calculation {

int z;

public void addition(int x, int y) {

z = x + y;

System.out.println("The sum of the given numbers:"+z);

}

public void Subtraction(int x, int y) {

z = x - y;

System.out.println("The difference between the given numbers:"+z);

}}

public class My\_Calculation extends Calculation {

public void multiplication(int x, int y) {

z = x \* y;

System.out.println("The product of the given numbers:"+z);

}

public static void main(String args[]) {

int a = 20, b = 10;

My\_Calculation demo = new My\_Calculation();

demo.addition(a, b);

demo.Subtraction(a, b);

demo.multiplication(a, b);

}}

## Super keyword

The **super** keyword is similar to **this** keyword. Following are the scenarios where the super keyword is used.

* It is used to **differentiate the members** of superclass from the members of subclass, if they have same names.
* It is used to **invoke the superclass** constructor from subclass.

class Super\_class {

int num = 20;

// display method of superclass

public void display() {

System.out.println("This is the display method of superclass");

}

}

public class Sub\_class extends Super\_class {

int num = 10;

// display method of sub class

public void display() {

System.out.println("This is the display method of subclass");

}

public void my\_method() {

// Instantiating subclass

Sub\_class sub = new Sub\_class();

// Invoking the display() method of sub class

sub.display();

// Invoking the display() method of superclass

super.display();

// printing the value of variable num of subclass

System.out.println("value of the variable named num in sub class:"+ sub.num);

// printing the value of variable num of superclass

System.out.println("value of the variable named num in super class:"+ super.num);

}

public static void main(String args[]) {

Sub\_class obj = new Sub\_class();

obj.my\_method();

}

}

## Invoking Superclass Constructor

super(values);

Sample Code :

class Superclass {

int age;

Superclass(int age) {

this.age = age;

}

public void getAge() {

System.out.println("The value of the variable named age in super class is: " +age);

}

}

public class Subclass extends Superclass {

Subclass(int age) {

super(age);

}

public static void main(String argd[]) {

Subclass s = new Subclass(24);

s.getAge();

}}

## IS-A Relationship

IS-A is a way of saying: This object is a type of that object. Let us see how the **extends** keyword is used to achieve inheritance.

class Animal {

}

class Mammal extends Animal {

}

class Reptile extends Animal {

}

public class Dog extends Mammal {

public static void main(String args[]) {

Animal a = new Animal();

Mammal m = new Mammal();

Dog d = new Dog();

System.out.println(m instanceof Animal);

System.out.println(d instanceof Mammal);

System.out.println(d instanceof Animal);

}

}

 The **implements** keyword is used with classes to inherit the properties of an interface. Interfaces can never be extended by a class.

## The instanceof Keyword

Let us use the **instanceof** operator to check determine whether Mammal is actually an Animal, and dog is actually an Animal.

**Example**

interface Animal{}

class Mammal implements Animal{}

public class Dog extends Mammal {

public static void main(String args[]) {

Mammal m = new Mammal();

Dog d = new Dog();

System.out.println(m instanceof Animal);

System.out.println(d instanceof Mammal);

System.out.println(d instanceof Animal);

}

}

## HAS-A relationship

These relationships are mainly based on the usage. This determines whether a certain class **HAS-A** certain thing. This relationship helps to reduce duplication of code as well as bugs.

**Example**

public class Vehicle{}

public class Speed{}

public class Van extends Vehicle {

private Speed sp;

}

This shows that class Van HAS-A Speed. By having a separate class for Speed, we do not have to put the entire code that belongs to speed inside the Van class, which makes it possible to reuse the Speed class in multiple applications.

## Types of Inheritance

There are various types of inheritance as demonstrated below.



# Java – Overriding

# The benefit of overriding is: ability to define a behavior that's specific to the subclass type, which means a subclass can implement a parent class method based on its requirement.

class Animal {

public void move() {

System.out.println("Animals can move");

}

}

class Dog extends Animal {

public void move() {

System.out.println("Dogs can walk and run");

}

public void bark() {

System.out.println("Dogs can bark");

}

}

public class TestDog {

public static void main(String args[]) {

Animal a = new Animal(); // Animal reference and object

Animal b = new Dog(); // Animal reference but Dog object

a.move(); // runs the method in Animal class

b.move(); // runs the method in Dog class

b.bark();

}

}

Java - Polymorphism

Polymorphism is the ability of an object to take on many forms. The most common use of polymorphism in OOP occurs when a parent class reference is used to refer to a child class object.

An overridden method is essentially hidden in the parent class, and is not invoked unless the child class uses the super keyword within the overriding method.

### Example

/\* File name : Employee.java \*/

public class Employee {

private String name;

private String address;

private int number;

public Employee(String name, String address, int number) {

System.out.println("Constructing an Employee");

this.name = name;

this.address = address;

this.number = number;

}

public void mailCheck() {

System.out.println("Mailing a check to " + this.name + " " + this.address);

}

public String toString() {

return name + " " + address + " " + number;

}

public String getName() {

return name;

}

public String getAddress() {

return address;

}

public void setAddress(String newAddress) {

address = newAddress;

}

public int getNumber() {

return number;

}

}

Now suppose we extend Employee class as follows −

/\* File name : Salary.java \*/

public class Salary extends Employee {

private double salary; // Annual salary

public Salary(String name, String address, int number, double salary) {

super(name, address, number);

setSalary(salary);

}

public void mailCheck() {

System.out.println("Within mailCheck of Salary class ");

System.out.println("Mailing check to " + getName()

+ " with salary " + salary);

}

public double getSalary() {

return salary;

}

public void setSalary(double newSalary) {

if(newSalary >= 0.0) {

salary = newSalary;

}

}

public double computePay() {

System.out.println("Computing salary pay for " + getName());

return salary/52;

}

}

Java - Abstraction

**Abstraction** is a process of hiding the implementation details from the user, only the functionality will be provided to the user. In other words, the user will have the information on what the object does instead of how it does it.

A class which contains the **abstract** keyword in its declaration is known as abstract class.

/\* File name : Employee.java \*/

public abstract class Employee {

private String name;

private String address;

private int number;

public Employee(String name, String address, int number) {

System.out.println("Constructing an Employee");

this.name = name;

this.address = address;

this.number = number;

}

public double computePay() {

System.out.println("Inside Employee computePay");

return 0.0;

}

public void mailCheck() {

System.out.println("Mailing a check to " + this.name + " " + this.address);

}

public String toString() {

return name + " " + address + " " + number;

}

public String getName() {

return name;

}

public String getAddress() {

return address;

}

public void setAddress(String newAddress) {

address = newAddress;

}

public int getNumber() {

return number;

} }

## Abstract Methods

If you want a class to contain a particular method but you want the actual implementation of that method to be determined by child classes, you can declare the method in the parent class as an abstract.

* **abstract** keyword is used to declare the method as abstract.

public abstract class Employee {

private String name;

private String address;

private int number;

public abstract double computePay();

// Remainder of class definition

}

Java - Encapsulation

**Encapsulation** in Java is a mechanism of wrapping the data (variables) and code acting on the data (methods) together as a single unit.

 In encapsulation, the variables of a class will be hidden from other classes, and can be accessed only through the methods of their current class. Therefore, it is also known as data hiding.

To achieve encapsulation in Java −

* Declare the variables of a class as private.
* Provide public setter and getter methods to modify and view the variables values.

/\* File name : EncapTest.java \*/

public class EncapTest {

private String name;

private String idNum;

private int age;

public int getAge() {

return age;

}

public String getName() {

return name;

}

public String getIdNum() {

return idNum;

}

public void setAge( int newAge) {

age = newAge;

}

public void setName(String newName) {

name = newName;

}

public void setIdNum( String newId) {

idNum = newId;

}

}

Any class that wants to access the variables should access them through these getters and setters.

The variables of the EncapTest class can be accessed using the following program −

/\* File name : RunEncap.java \*/

public class RunEncap {

public static void main(String args[]) {

EncapTest encap = new EncapTest();

encap.setName("James");

encap.setAge(20);

encap.setIdNum("12343ms");

System.out.print("Name : " + encap.getName() + " Age : " + encap.getAge());

}

}

## Benefits of Encapsulation

* The fields of a class can be made read-only or write-only.
* A class can have total control over what is stored in its fields.

Java - Interfaces

An interface is a reference type in Java. It is similar to class. It is a collection of abstract methods. A class implements an interface, thereby inheriting the abstract methods of the interface.

The **interface** keyword is used to declare an interface. Here is a simple example to declare an interface −

### Example

Following is an example of an interface −

/\* File name : NameOfInterface.java \*/

import java.lang.\*;

// Any number of import statements

public interface NameOfInterface {

// Any number of final, static fields

// Any number of abstract method declarations\

}

Java - Packages

A **Package** can be defined as a grouping of related types (classes, interfaces, enumerations and annotations ) providing access protection and namespace management.

* **java.lang** − bundles the fundamental classes
* **java.io** − classes for input , output functions are bundled in this package

package animals;

/\* File name : MammalInt.java \*/

public class MammalInt implements Animal {

public void eat() {

System.out.println("Mammal eats");

}

public void travel() {

System.out.println("Mammal travels");

}

public int noOfLegs() {

return 0;

}

public static void main(String args[]) {

MammalInt m = new MammalInt();

m.eat();

m.travel();

}

}