Abstraction-

-Abstraction is the concept of hiding the internal details and describing things in simple terms.

-For example, a method that adds two integers. The method internal processing is hidden from outer world.

-There are many ways to achieve abstraction in object oriented programming, such as encapsulation and inheritance.

-A java program is also a great example of abstraction. Here java takes care of converting simple statements to machine language and hides the inner implementation details from outer world.

Encapsulation

-Encapsulation is the technique used to implement abstraction in object oriented programming.

-Encapsulation is used for access restriction to a class members and methods.

-Access modifier keywords are used for encapsulation in object oriented programming.

-For example, encapsulation in java is achieved using private, protected and public keywords.

Polymorphism

-Polymorphism is the concept where an object behaves differently in different situations.

-There are two types of polymorphism – compile time polymorphism and runtime polymorphism.

-Compile time polymorphism is achieved by method overloading. For example, we can have a class as below.

public class Circle {

public void draw(){

System.out.println("Drwaing circle with default color Black and diameter 1 cm.");

}

public void draw(int diameter){

System.out.println("Drwaing circle with default color Black and diameter"+diameter+" cm.");

}

public void draw(int diameter, String color){

System.out.println("Drwaing circle with color"+color+" and diameter"+diameter+" cm.");

}

}

Here we have multiple draw methods but they have different behavior. This is a case of method overloading because all the methods name is same and arguments are different. Here compiler will be able to identify the method to invoke at compile time, hence it’s called compile time polymorphism.

Runtime polymorphism is implemented when we have “IS-A” relationship between objects. This is also called as method overriding because subclass has to override the superclass method for runtime polymorphism. If we are working in terms of superclass, the actual implementation class is decided at runtime. Compiler is not able to decide which class method will be invoked. This decision is done at runtime, hence the name as runtime polymorphism or dynamic method dispatch.

package com.journaldev.test;

public interface Shape {

public void draw();

}

package com.journaldev.test;

public class Circle implements Shape{

@Override

public void draw(){

System.out.println("Drwaing circle");

}

}

package com.journaldev.test;

public class Square implements Shape {

@Override

public void draw() {

System.out.println("Drawing Square");

}

}

Shape is the superclass and there are two subclasses Circle and Square. Below is an example of runtime polymorphism.

Shape sh = new Circle();

sh.draw();

Shape sh1 = getShape(); //some third party logic to determine shape

sh1.draw();

In above examples, java compiler don’t know the actual implementation class of Shape that will be used at runtime, hence runtime polymorphism.

Inheritance

-Inheritance is the object oriented programming concept where an object is based on another object.

-Inheritance is the mechanism of code reuse. The object that is getting inherited is called superclass and the object that inherits the superclass is called subclass.

We use extends keyword in java to implement inheritance. Below is a simple example of inheritance in java.

package com.journaldev.java.examples1;

class SuperClassA {

public void foo(){

System.out.println("SuperClassA");

}

}

class SubClassB extends SuperClassA{

public void bar(){

System.out.println("SubClassB");

}

}

public class Test {

public static void main(String args[]){

SubClassB a = new SubClassB();

a.foo();

a.bar();

}

}

Association

-Association is the OOPS concept to define the relationship between objects.

-Association defines the multiplicity between objects.

-For example Teacher and Student objects. There is one to many relationship between a teacher and students. Similarly a student can have one to many relationship with teacher objects. However both student and teacher objects are independent of each other.

Aggregation

-Aggregation is a special type of association. In aggregation, objects have their own life cycle but there is an ownership. Whenever we have “HAS-A” relationship between objects and ownership then it’s a case of aggregation.

Composition

-Composition is a special case of aggregation. Composition is a more restrictive form of aggregation. When the contained object in “HAS-A” relationship can’t exist on it’s own, then it’s a case of composition. For example, House has-a Room. Here room can’t exist without house.