**Object Oriented Programing Concepts (OOPs)**

OOPs is the methodology to design a program using classes and objects.

There are four major pillars are there.

* **Inheritance**
* **Polymorphism**
* **Abstraction**
* **Encapsulation**

Apart from that

* **Coupling**
* **Cohesion**
* **Association**
* **Aggregation**
* **Composition**

**Object**

Object is an entity that has some state and behaviour.

Object are instance of classes.

**Class**

Class is Blueprint or Template to define the Objects.

It has Fields and Method.

**Inheritance (IS-A)**

Inheritance means one Object can acquires all the properties and behaviours of another Object.

It provide code reusability.

With the help of inheritance we can achieve run time polymorphism using method overriding.

It represent IS-A relationship.

We can use the extends keyword for making inheritance.

For Example

class Employee{  
 float salary=40000;  
}  
class Programmer extends Employee{  
 int bonus=10000;  
 public static void main(String args[]){  
 Programmer p=new Programmer();  
 System.*out*.println("Programmer salary is:"+p.salary);  
 System.*out*.println("Bonus of Programmer is:"+p.bonus);  
 }  
}

In this Example **Programmer IS-A Employee** relationship.

Types of Inheritance is Singe, Multilevel, Hierarchical.

Multiple inheritance is not support in Java.

**Why Multiple Inheritance is not support in Java?**

To reduce Complexity and Ambiguity.

**Inheritance (IS-A)**

**Aggregation (HAS-A)**

**Aggregation (HAS-A)**

It means one class Has a property of second class.

In simple way Person class HAS-A Address class.

**Polymorphism**

Polymorphism means one task can perform in different ways.

We can achieve Polymorphism by using term Method Overloading and Method Overriding.

**Method Overloading – Compile Time Polymorphism**

**Method Overriding – Runtime Polymorphism**

**Method Overloading**

One class having more than one methods having same name but different argument is called Method Overloading

No. of Argument id different

Argument type is different

Arguments order is different

If No. of Arguments is same and also type then we can’t Change Return type.

**Method Overriding**

Where sub class or childe class having same method of super class or parent class is called Method Overriding.

Method must have same name as in parent class.

Method must have same parameter as in parent class.

There must be IS-A relationship.

**Covariant Return Type**

After Java 5 it is possible to change return type of method in method overriding but the return type has Non primitive and subclass of the parent class.

**Abstraction**

In simple way Abstraction means Hiding internal details and showing only functionality.

We use Abstraction Class and Interface to achieve Abstraction.

Using Abstract keyword on class is known as Abstract Class.

Abstract class have Abstract method and Non-Abstract method.

Abstract Class – 0 to 100

Interface – 100%

**Interface**

Interface is like blueprint of class.

Interface has Static constant and abstract methods.

Same as Abstraction Hiding internal details and showing only functionality.

Interface used to achieve Abstraction.

In all method is abstract by default means no body but Since Java 8 we have default method and Static methods.

And also since Java 9 Private Method is in Interface.

Interface is indirectly achieve Multiple Inheritance.

**Marker Interface**

An interface which has no member is known as Marker Interface for example Serializable, Cloneable etc.

Marker Interface is use to provide some essential information to JVM so that JVM will perform some useful operation.

**Encapsulation**

Encapsulation means the process of biding or wrapping all the code and data in single unit.

We can create fully Encapsulated class by making all data members private in class.

We can use the getter and setter for get the data and set the data.

**Association**

Association represent the relationship between the objects.

Means one object can associate with other object.

**Aggregation** and **Composition** is the way of archive Association

In Aggregation represent week relation in the objects and other hand Composition represent strong relation in between objects.

**Constructor**

Constructor is a block of code similar to method.

It has same name as class name.

Constructor is create at the time creation class instance and memory for object is allocated in memory.

Every time we create an instance of class then it will automatically invoke or call constructor.

If constructor is not present then java compiler is provide default constructor.

Constructor cannot be Static, Abstract, Final and Synchronized.

Purpose of default constructor is to provide the default value to the object like 0, null etc. Deepening on its type.

Two type of Constructors

Default and Parameterized

**Constructor Overloading**

Constructor Overloading is just like method overloading without return type.

**Static Keyword**

Static keyword is belong to method area where method or variables is belong to class itself rather than instance of that class.

When member (variable or method) is declared as Static then that there is only one instance is shared by all instance of the class.

Beast Advantage of Static is make the program Memory Efficient.

Static can be :

* **Static Variable**
* **Static Method**
* **Static Block**
* **Nested Static Class**

**Static Variable**

It also called class Variable means it belong to class level.

It means the variable is associated with the class itself rather than instance of that class.

There will be only one copy of that variable shared by all other instance of the class.

Static variable initialize only once when the execution of program.

class MyClass  
{  
 static int *i* = 10;  
 public MyClass()  
 {  
 System.*out*.println(*i* = *i* + 10); // 20 30 40  
 } // if not static int i then o/p :- 20 20 20  
}  
public class StaticKeyword {  
 public static void main(String[] args) {  
 MyClass m1 = new MyClass();  
 MyClass m2 = new MyClass();  
 MyClass m3 = new MyClass();  
 }  
}

**Static Method**

Static method belong to class it will call by class name rather than instance of that class.

Static method can access only static variables.

This and Super keyword is not used in this context.

class MyClassStaticMethod  
{  
 static int *i* = 10;  
// int i = 10;  
 public static void myStaticMethod()  
 {  
 System.*out*.println(*i* = *i* + 10);  
 }  
}  
public class StaticKeyword {  
 public static void main(String[] args) {  
  
 MyClassStaticMethod.*myStaticMethod*(); // O/P :- 20  
 MyClassStaticMethod.*myStaticMethod*(); // O/P :- 30  
 MyClassStaticMethod.*myStaticMethod*(); // O/P :- 40  
  
 MyClassStaticMethod staticInstance = new MyClassStaticMethod();  
// staticInstance.myStaticMethod(); // we cant call this by using instance  
 }  
}

**Static Block**

Static Block is execute before main method at the time classloading.

public class StaticKeyword {  
 static {  
 System.*out*.println("Static Block is called");  
 }  
 public static void main(String[] args) {

System.*out*.println("Main method is called");  
 }  
}

O/P 🡪

Static Block is called

Main method is called

**Nested Static Class**

In Java, a class can be defined within another class. When a nested class is declared as static, it is called a static nested class. Static nested classes are associated with the outer class rather than with instances of the outer class.

class OuterClass {  
 static class StaticNestedClass {  
 // static nested class  
 }  
}

It's important to note that since static members belong to the class itself, they can be accessed using the class name directly, without needing to create an instance of the class. However, they cannot access non-static members of the class directly because static members are not associated with any particular instance.

**This Keyword**

This keyword can be use for refer the current class instance variable.

It also refers the current class constructor and method.

**Super Keyword**

Super keyword can be use to refer super class method and contractors and invoke parent class instance variable.

**Final Keyword**

**Static Binding (also known as Early Binding).** – Normal we create class object which is not extend any class.

**Dynamic Binding (also known as Late Binding).** – Like Runtime polymorphism where we create reference of parent class and instance of chilled class.

**Object Cloning**

**Wrapper Class**

**Command Line Argument**