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Java Programming

Lesson 6 - Classes and Objects

WHAT WILL YOU LEARN IN THIS SESSION ?

- Define what a class is and how it relates to real-world objects.
- Explain the concept of an object and its role in Java programming.
- Create a basic Java class with attributes and methods.
- Use access modifiers appropriately to control the visibility and accessibility of class members
- Writing Java programs that include examples of instance variables, class variables, final variables, and local variables.

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01

Introduction to Classes and Objects

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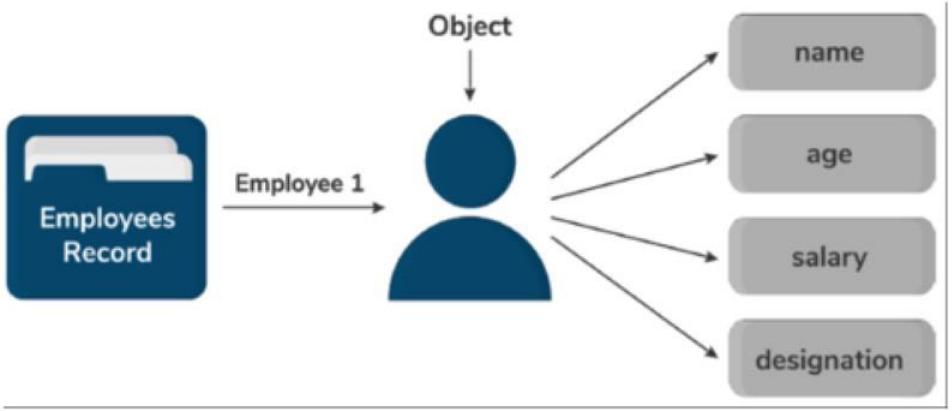
Introduction

We use programming to solve real-world problems, and it won't make much sense if one can't model real-world scenarios using programming languages. This is where object-oriented programming comes into play.

Object-oriented programming ,also called OOP, is a programming model that is dependent on the **concept of Objects and classes.**



Java objects

- Java is an object-oriented programming language.
- Everything in Java is associated with classes and objects.
- An object is any entity that has a state and behavior.
- For example: in real life, a car is an object.
- The car has attributes, such as weight and color, and methods, such as drive and brake.

Java Class

- A class is a blueprint for the object.
- Before we create an object, we first need to define the class.
- We can think of the class as a sketch (prototype) of a house.
- It contains all the details about the floors, doors, windows, etc.
- Based on these descriptions we build the house.
- House is the object.

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Java Class Syntax

```
class ClassName
{
 // fields
 // methods
}
```

- fields are used to store data
- methods are used to perform some operations

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Java Class

A class in Java can contain:

- Fields
- Methods
- Constructors
- Blocks
- Nested class and interface

Java Class

- For bicycle object, we can create the class as:

```
class Bicycle {

  // state or field
    int gear = 5;

  // behavior or method
  public void braking() {
    System.out.println("Working of Braking");
  }
}
```

Java Objects

- An object is called an instance of a class.
- For example, suppose Bicycle is a class then MountainBicycle, SportsBicycle, TouringBicycle, etc can be considered as objects of the class.

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Creating an Object in Java

- Java Object Syntax: `className variable_name = new className();`

// for Bicycle class

- `Bicycle sportsBicycle = new Bicycle();`

- `Bicycle touringBicycle = new Bicycle();`

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Creating an Object in Java

- className is the name of class that can be anything like: Bicycle that we declared in the above example.

- variable_name is name of reference variable that is used to hold the reference of created object.

- The new is a keyword which is used to allocate memory for the object.

Example: Creating a Class and its object

```
public class Student{
        String name;
        int rollno;
        int age;

       void info(){
        System.out.println("Name: "+name);
        System.out.println("Roll Number: "+rollno);
        System.out.println("Age: "+age);
       }
```

Example: Creating a Class and its object

```
public static void main(String[] args) {
        Student student = new Student();
        // Accessing and property value
        student.name = "Ramesh";
        student.rollno = 253;
        student.age = 25;
        // Calling method
        student.info();
    }
}
```

```
    // Calling method
    student.info();
}
}
```

Output:

Name: Ramesh

Roll Number: 253

Age: 25

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Three ways to initialize object

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There are 3 ways to initialize object in Java.

- By reference variable
- By method
- By constructor

1) Object and Class Example: Initialization through reference

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- Initializing an object means storing data into the object.

```
class Student{
 int id;
 String name;
}

class TestStudent2{

 public static void main(String args[]){
  Student s1=new Student();
  s1.id=101;
  s1.name="Sonoo";
  System.out.println(s1.id+" "+s1.name);
 }
}
```

We can also create multiple objects and store information in it through reference variable.

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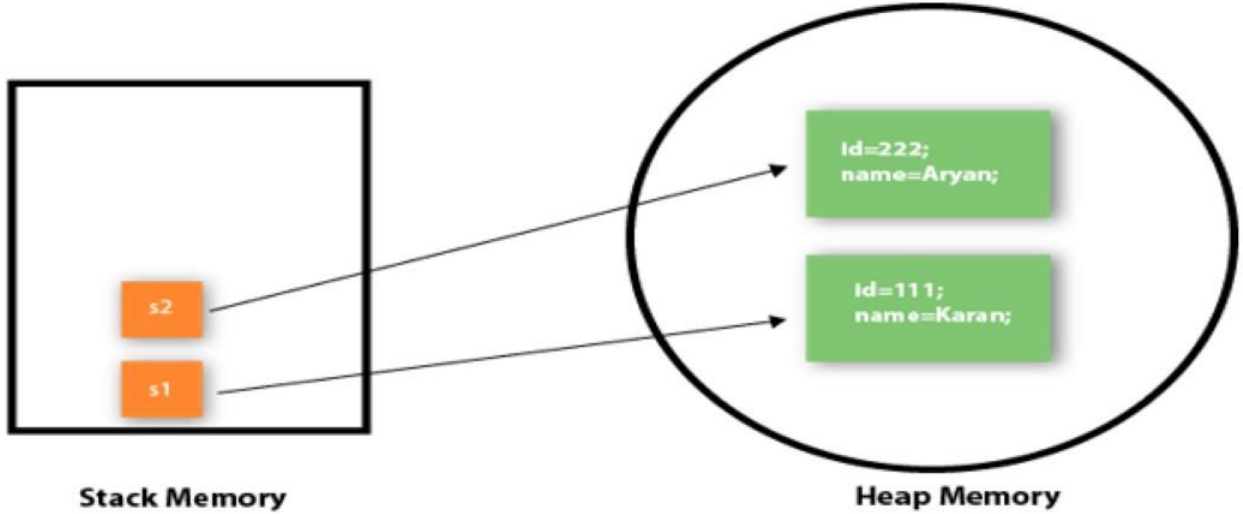
```
class Student{
 int id;
 String name;
}
class TestStudent3{
 public static void main(String args[]){
  //Creating objects
  Student s1=new Student();
  Student s2=new Student();
  //Initializing objects
  s1.id=101;
  s1.name="Sonoo";
  s2.id=102;
  s2.name="Amit";
  System.out.println(s1.id+" "+s1.name);
  System.out.println(s2.id+" "+s2.name);
 }
}
```

2) Object and Class Example: Initialization through method

- In this example, we are creating the two objects of Student class and initializing the value to these objects by invoking the insertRecord method.
- Here, we are displaying the state (data) of the objects by invoking the displayInformation() method.

```
class Student{
 int rollno;
 String name;
 void insertRecord(int r, String n){
  rollno=r;
  name=n;
 }
 void
displayInformation(){System.out.println(rollno+"
"+name);
}
}
```

```
class TestStudent4{
 public static void main(String args[]){
  Student s1=new Student();
  Student s2=new Student();
  s1.insertRecord(111,"Karan");
  s2.insertRecord(222,"Aryan");
  s1.displayInformation();
  s2.displayInformation();
 }
}
```



- Object gets the memory in heap memory area.
- The reference variable refers to the object allocated in the heap memory area.
- Here, s1 and s2 both are reference variables that refer to the objects allocated in memory.

3) Object and Class Example: Initialization through a constructor

03

Constructors in Java

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What is a Constructor?

- A constructor in Java is a **special method** that is called when an object is instantiated.
- Its primary purpose is to **initialize** the newly created object.
- Constructors have the **same name as the class** and do not have a return type.

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Types of Constructors

- Default Constructor
- Parameterized Constructor
- Copy Constructor

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1. Default Constructor

- A default constructor is a **no-argument constructor** that the Java compiler automatically provides if no other constructors are defined in the class.

- It initializes the object with **default values**.

Example:

```
public static void main(String[] args) {
        Dog dog = new Dog(); // Default constructor is called
        System.out.println(dog.getName());
          System.out.println(dog.getAge());
 }
```

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2. Parameterized Constructor

A parameterized constructor allows you to initialize an object with specific values provided as **arguments.**

Example:

```
public Dog(String name, int age) {
        name = name;
        age = age;
    }
public static void main(String[] args) {
          Dog dog = new Dog("Buddy", 3);
             System.out.println(dog.getName());
}
```

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3. Copy Constructor

- A copy constructor creates a new object by **copying** the attributes of an existing object.
- Java does **not provide a default copy constructor**, so you have to define it yourself.

Example:

```
public Dog(Dog dog) {
        name = name;
        age = age;
    }
public static void main(String[] args) {
        Dog dog1 = new Dog("Buddy", 3);
        Dog dog2 = new Dog(dog1);
        System.out.println(dog2.getName());
        System.out.println(dog2.getAge());
    }
```

Scenario: Social Media Platform (e.g., Instagram)

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Example Classes:

- **User Class:** Represents a user on the platform.
- **Post Class:** Represents a post made by a user.
- **Comment Class:** Represents a comment made on a post.
- **Message Class:** Represents a direct message between users.

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1.User Class:

```
public User(String userIdParam, String usernameParam, String emailParam,
String profilePictureUrlParam) {
        userId = userIdParam;
        username = usernameParam;
        email = emailParam;
        profilePictureUrl = profilePictureUrlParam;
    }
```

```
User newUser = new User("U001", "john_doe", "john.doe@example.com", "profilePicUrl");
```

2.Post Class:

```
public Post(String postIdParam, User userParam, String contentParam, String
imageUrlParam, Date timestampParam) {
        postId = postIdParam;
        user = userParam;
        content = contentParam;
        imageUrl = imageUrlParam;
        timestamp = timestampParam;
        comments = new ArrayList<>();
    }
```

```
Post newPost = new Post("P001", newUser, "Had a great day!", "imageUrl",
new Date());
```

3.Comment Class:

```
public Comment(String commentIdParam, User userParam, String textParam,
Date timestampParam) {
        commentId = commentIdParam;
        user = userParam;
        text = textParam;
        timestamp = timestampParam;
    }
```

Comment newComment = new Comment("C001", newUser, "Nice picture!", new Date());

4.Message Class

```
public Message(String messageIdParam, User senderParam, User receiverParam,
String textParam, Date timestampParam) {
        messageId = messageIdParam;
        sender = senderParam;
        receiver = receiverParam;
        text = textParam;
        timestamp = timestampParam;
    }
```

Message newMessage = new Message("M001", newUser, receiverUser, "Hello!", new Date());

Summary

1. In these popular online platforms, constructors play a **vital role** in initializing objects with the necessary data, ensuring that each entity in the system is properly set up.

1. This approach helps maintain a consistent and reliable state across the application's various components, making it easier to manage interactions between users, posts, comments, and messages.

THANK YOU