

# WEEK 10

1. Create class Person (Data Member- name, phone). Create two member inner classes Address (Data Member- House\_No, Street, City, State; Method- displayAddr()) and DateOfBirth (Data Member- Day, Month, Year; Method- displayDOB()). Display() is the method of Person class which will display name, address and date of birth of a Person object.

```

Main.java  Person.java x
1 package week10_1;
2
3 class Person { 2 usages
4     String name; 2 usages
5     String phone; 2 usages
6     private Address address; 2 usages
7     private DateOfBirth dob; 2 usages
8
9     public Person(String name, String phone, String houseNo, String street,
10        String city, String state, int day, int month, int year) {
11        this.name = name;
12        this.phone = phone;
13        this.address = new Address(houseNo, street, city, state);
14        this.dob = new DateOfBirth(day, month, year);
15    }
16    public void Display() { 1 usage
17        System.out.println("--- Person Details ---");
18        System.out.println("Name: " + this.name);
19        System.out.println("Phone: " + this.phone);
20
21        this.address.displayAddr();
22        this.dob.displayDOB();
23        System.out.println("-----");
24    }
25
26 class Address { 2 usages
27     String House_No; 2 usages
28     String Street; 2 usages
29     String City; 2 usages
30     String State; 2 usages
31
32     public Address(String houseNo, String street, String city, String state) {
33         this.House_No = houseNo;
34         this.Street = street;
35         this.City = city;
36         this.State = state;
37     }
38
39     public void displayAddr() { 1 usage
40         System.out.println("Address: " + this.House_No + ", " +
41             this.Street + ", " + this.City + ", " + this.State);
42     }
43 }
44 class DateOfBirth { 2 usages
45     int Day; 2 usages
46     int Month; 2 usages
47     int Year; 2 usages
48
49     public DateOfBirth(int day, int month, int year) { 1 usage
50         this.Day = day;
51         this.Month = month;
52         this.Year = year;
53     }
54
55     public void displayDOB() { 1 usage
56         System.out.println("Date of Birth: " +
57             this.Day + "/" + this.Month + "/" + this.Year);
58     }
59 }
60 }
```

# WEEK 10

```
Main.java x Person.java
1 package week10_1;
2
3 public class Main {
4     public static void main(String[] args) {
5         Person person1 = new Person(
6             name: "Amit Kumar",
7             phone: "+91-9876543210",
8             houseNo: "123-B",
9             street: "Kamla Nagar",
10            city: "Agra",
11            state: "Uttar Pradesh",
12            day: 15,
13            month: 8,
14            year: 1990
15        );
16        person1.Display();
17    }
18 }
```

```
--- Person Details ---
Name: Amit Kumar
Phone: +91-9876543210
Address: 123-B, Kamla Nagar, Agra, Uttar Pradesh
Date of Birth: 15/8/1990
-----
```

2. Create class Edible. Within that define two static classes Fruit and Vegetable. Fruit class will have two methods- fruitDetails() is a static method and fruitPackaging() is a non-static method. Vegetable class also has similar methods - vegetableDetails() and vegetablePackaging(). Call all the four methods from main method.

# WEEK 10

```
Main.java x Edible.java
1 package week10_2;
2
3 public class Main {
4
5     public static void main(String[] args) {
6
7         System.out.println("--- Demonstrating Fruit Class ---");
8         Edible.Fruit.fruitDetails();
9
10        Edible.Fruit myFruit = new Edible.Fruit();
11        myFruit.fruitPackaging();
12
13        System.out.println("\n--- Demonstrating Vegetable Class ---");
14        Edible.Vegetable.vegetableDetails();
15
16        Edible.Vegetable myVegetable = new Edible.Vegetable();
17        myVegetable.vegetablePackaging();
18    }
19 }
```

```
Main.java x Edible.java x
1 package week10_2;
2
3 public class Edible { 6 usages
4
5     public static class Fruit { 3 usages
6         public static void fruitDetails() { 1 usage
7             System.out.println("Static Method (Fruit)");
8         }
9         public void fruitPackaging() { 1 usage
10             System.out.println("Non-Static Method (Fruit)");
11         }
12     }
13     public static class Vegetable { 3 usages
14         public static void vegetableDetails() { 1 usage
15             System.out.println("Static Method (Vegetable)");
16         }
17         public void vegetablePackaging() { 1 usage
18             System.out.println("Non-Static Method (Vegetable)");
19         }
20     }
21 }
```

```
--- Demonstrating Fruit Class ---
Static Method (Fruit)
Non-Static Method (Fruit)

--- Demonstrating Vegetable Class ---
Static Method (Vegetable)
Non-Static Method (Vegetable)
```

## WEEK 10

3. Create three different minMaxAdd() methods to calculate minimum, maximum and addition of integers, real numbers and characters.

```
Main.java x
1 package week10_3;
2
3 public class Main {
4     public static void minMaxAdd(int a, int b) { 1 usage
5         System.out.println("Integer");
6         System.out.println("Min: " + Math.min(a, b));
7         System.out.println("Max: " + Math.max(a, b));
8         System.out.println("Sum: " + (a + b));
9     }
10    public static void minMaxAdd(double a, double b) { 1 usage
11        System.out.println("Double (Real)");
12        System.out.println("Min: " + Math.min(a, b));
13        System.out.println("Max: " + Math.max(a, b));
14        System.out.println("Sum: " + (a + b));
15    }
16    public static void minMaxAdd(char a, char b) { 1 usage
17        System.out.println("Character");
18        System.out.println("Min: '" + (char)Math.min(a, b) + "'");
19        System.out.println("Max: '" + (char)Math.max(a, b) + "'");
20        System.out.println("Sum (as int): " + (a + b));
21    }
22    public static void main(String[] args) {
23        minMaxAdd(a: 10, b: 20);
24        minMaxAdd(a: 7.5, b: 3.2);
25        minMaxAdd(a: 'B', b: 'X');
26    }
27 }
```

Integer

Min: 10

Max: 20

Sum: 30

Double (Real)

Min: 3.2

Max: 7.5

Sum: 10.7

Character

Min: 'B'

Max: 'X'

Sum (as int): 154

4. Create a class ObjectOriented which has methods- abstraction(), polymorphism() and inheritance(). Create a class JavaLanguage which inherits from ObjectOriented class and has its own methods- persistence() and interfaces(). Create an object of JavaLanguage class to access all of its own and parent's methods.
5. In previous question, create a new class C++ which also inherits from ObjectOriented class and has its own methods- template() and friendFunction(). Create an object of C++ class to access all of its own and parent's methods.

# WEEK 10

Main.java x JavaLanguage.java ObjectOriented.java Cpp.java

1 package week10\_4;

2

3 public class Main {

4 public static void main(String[] args) {

5

6 JavaLanguage myJava = new JavaLanguage();

7 System.out.println("Accessing Parent's Methods (from ObjectOriented)");

8 myJava.abstraction();

9 myJava.polymorphism();

10 myJava.inheritance();

11

12 System.out.println("\nAccessing Own Methods (from JavaLanguage)");

13 myJava.persistence();

14 myJava.interfaces();

15

16 Cpp myCpp = new Cpp();

17 System.out.println("\nAccessing Parent's Methods (from ObjectOriented)");

18 myCpp.abstraction();

19 myCpp.polymorphism();

20 myCpp.inheritance();

21

22 System.out.println("\nAccessing Own Methods (from CppLanguage)");

23 myCpp.template();

24 myCpp.friendFunction();

25 }

26 }

27

i.java ObjectOriented.java x JavaLanguage.

package week10\_4;

class ObjectOriented { 2 usages 2 inheritors

public void abstraction() { 2 usages

System.out.println("Abstraction");

}

public void polymorphism() { 2 usages

System.out.println("Polymorphism");

}

public void inheritance() { 2 usages

System.out.println("Inheritance");

}

}

i.java ObjectOriented.java JavaLanguage

package week10\_4;

class JavaLanguage extends ObjectOriented {

public void persistence() { 1 usage

System.out.println("Persistence");

}

public void interfaces() { 1 usage

System.out.println("Interfaces");

}

}

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# WEEK 10

```
© Main.java  © ObjectOriented.java  © JavaLanguage.java  © Cpp.java x
1 package week10_4;
2
3 class Cpp extends ObjectOriented { 2 usages
4 >     public void template() { System.out.println("Templates"); }
7 >     public void friendFunction() { System.out.println("Friend Functions"); }
10 }
11
```

Accessing Parent's Methods (from ObjectOriented)

Abstraction

Polymorphism

Inheritance

Accessing Own Methods (from JavaLanguage)

Persistence

Interfaces

Accessing Parent's Methods (from ObjectOriented)

Abstraction

Polymorphism

Inheritance

Accessing Own Methods (from CppLanguage)

Templates

Friend Functions

6. Create class University which has data members- name and ranking. Create class Faculty that extends University class has data member- name and method- Details(). Create a new class Department which is derived from Faculty and has data member- name, chairman and method- Details() and Display() where Display() method calls Details() methods of both Faculty and Department class in its body. Create an object of Department class to Display() method and University ranking.

# WEEK 10

```
© Main.java × © University.java © Faculty.java © Department.java
1 package week10_6;
2
3 public class Main {
4     public static void main(String[] args) {
5         Department csDept = new Department(
6             uniName: "Stanford University",
7             ranking: 1,
8             facultyName: "School of Engineering",
9             deptName: "Computer Science",
10            chairman: "Dr. John Hennessy"
11        );
12        System.out.println("Calling Display():");
13        csDept.Display();
14        System.out.println("\nAccessing University Ranking directly:");
15        System.out.println("Ranking: " + csDept.ranking);
16    }
17 }
```

```
© Main.java © University.java × © Faculty.java © Dep:
1 package week10_6;
2
3 class University { 1 usage 2 inheritors
4     String name; 2 usages
5     int ranking; 2 usages
6
7     public University(String name, int ranking) {
8         this.name = name;
9         this.ranking = ranking;
10    }
11 }
```

```
© Main.java × © University.java © Faculty.java × © Department.java
1 package week10_6;
2
3 class Faculty extends University { 1 usage 1 inheritor
4     String name; 2 usages
5
6     public Faculty(String uniName, int ranking, String facultyName) {
7         super(uniName, ranking);
8         this.name = facultyName;
9     }
10    public void Details() { 2 usages 1 override
11        System.out.println("University: " + super.name);
12        System.out.println("Faculty: " + this.name);
13    }
14 }
```

# WEEK 10

```
© Main.java  © University.java  © Faculty.java  © Department.java x
1  package week10_6;
2
3  class Department extends Faculty { 2 usages
4      String name; 2 usages
5      String chairman; 2 usages
6
7      public Department(String uniName, int ranking, String facultyName, 1 usage
8                          String deptName, String chairman) {
9
10         super(uniName, ranking, facultyName);
11
12         this.name = deptName;
13         this.chairman = chairman;
14     }
15     @Override 2 usages
16     public void Details() {
17         System.out.println("Department: " + this.name);
18         System.out.println("Chairman: " + this.chairman);
19     }
20     public void Display() { 1 usage
21         super.Details();
22         this.Details();
23     }
24 }
```

```
Calling Display():
University: Stanford University
Faculty: School of Engineering
Department: Computer Science
Chairman: Dr. John Hennessy

Accessing University Ranking directly:
Ranking: 1
```

7. Create a class Employee (Data Members – empName, empId). Create two member inner classes: ● Salary (Data Members – basic, hra, pf; Method – displaySalary() to print salary details) ● JoiningDate (Data Members – day, month, year; Method – displayJoiningDate() to print joining date). In the Employee class, create a method displayEmployee() that prints the employee's name, ID, salary details, and joining date.



# WEEK 10

```

Main.java x Employee.java
1 package week10_7;
2
3 public class Main {
4     public static void main(String[] args) {
5         Employee emp1 = new Employee( empName: "Rajesh Kumar",
6             empId: 101, basic: 80000, hra: 20000,
7             pf: 8000, day: 14, month: 10, year: 2021);
8         emp1.displayEmployee();
9     }
10 }
11

Main.java Employee.java x
1 package week10_7;
2
3 class Employee {
4     String empName;
5     int empId;
6     private Salary salary;
7     private JoiningDate joiningDate;
8     public Employee(String empName, int empId, double basic,
9         double hra, double pf, int day, int month, int year) {
10         this.empName = empName;
11         this.empId = empId;
12         this.salary = new Salary(basic, hra, pf);
13         this.joiningDate = new JoiningDate(day, month, year);
14     }
15     public void displayEmployee() {
16         System.out.println("Employee Name: " + this.empName);
17         System.out.println("Employee ID: " + this.empId);
18         this.salary.displaySalary();
19         this.joiningDate.displayJoiningDate();
20     }
21 }
```

## WEEK 10

```
21 class Salary {
22     double basic;
23     double hra;
24     double pf;
25
26     public Salary(double basic, double hra, double pf) {
27         this.basic = basic;
28         this.hra = hra;
29         this.pf = pf;
30     }
31     public void displaySalary() {
32         double total = (this.basic + this.hra) - this.pf;
33         System.out.println("Salary Details for: " + empName);
34         System.out.println("Basic Pay: " + this.basic);
35         System.out.println("HRA: " + this.hra);
36         System.out.println("PF: " + this.pf);
37         System.out.println("Total Salary: " + total);
38     }
39 }
40 class JoiningDate {
41     int day;
42     int month;
43     int year;
44     public JoiningDate(int day, int month, int year) {
45         this.day = day;
46         this.month = month;
47         this.year = year;
48     }
49     public void displayJoiningDate() {
50         System.out.println("Joining Date: " + this.day + "/" + this.month + "/" + this.year);
51     }
52 }
53 }
```

```
Employee Name: Rajesh Kumar
Employee ID: 101
Salary Details for: Rajesh Kumar
Basic Pay: 80000.0
HRA: 20000.0
PF: 8000.0
Total Salary: 92000.0
Joining Date: 14/10/2021
```

**8. Create a class Shape with overloaded methods area():**

- area(int side)– calculates area of a square.
- area(int length, int breadth) – calculates area of a rectangle.
- area(double radius) – calculates area of a circle.

# WEEK 10

```
i.java x  Shape.java x
package week10_8;

public class Main {
    public static void main(String[] args) {
        Shape myShape = new Shape();
        myShape.area( side: 10);
        myShape.area( length: 20, breadth: 10);
        myShape.area( radius: 7.5);
    }
}

i.java x  Shape.java x
package week10_8;

class Shape { 2 usages
    public void area(int side) { 1 usage
        int result = side * side;
        System.out.println("Area of the Square: " + result);
    }
    public void area(int length, int breadth) { 1 usage
        int result = length * breadth;
        System.out.println("Area of the Rectangle: " + result);
    }
    public void area(double radius) { 1 usage
        double result = Math.PI * radius * radius;
        System.out.printf("Area of the Circle: %.2f\n", result);
    }
}
```

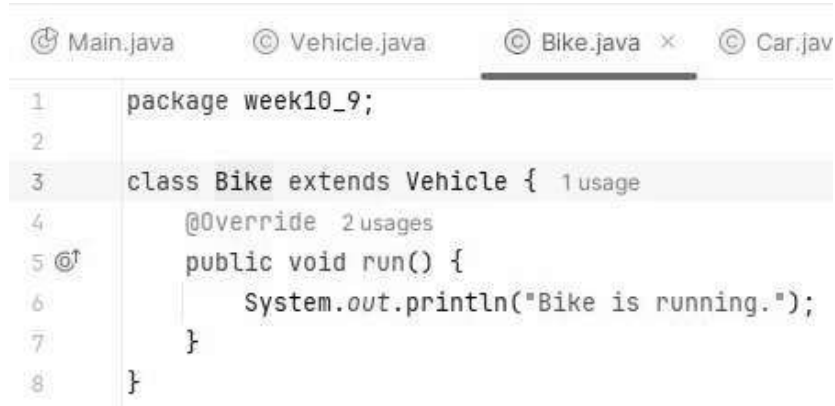
```
Area of the Square: 100
Area of the Rectangle: 200
Area of the Circle: 176.71
```

9. Create a class Vehicle with a method run(). Create subclasses Bike and Car that override the run() method. In the main() method, use a reference of Vehicle to call run() for objects of Bike and Car.


```
Main.java x  Vehicle.java  Bike.java  Ca
1 package week10_9;
2
3 public class Main {
4     public static void main(String[] args) {
5         Vehicle v1 = new Bike();
6         Vehicle v2 = new Car();
7         v1.run();
8         v2.run();
9     }
10 }

Main.java x  Vehicle.java x  Bike.java  Car.java
1 package week10_9;
2
3 class Vehicle { 4 usages 2 inheritors
4     public void run() { 2 usages 2 overrides
5         System.out.println("Vehicle is running.");
6     }
7 }
```

## WEEK 10



```
1 package week10_9;  
2  
3 class Bike extends Vehicle { 1 usage  
4     @Override 2 usages  
5     public void run() {  
6         System.out.println("Bike is running.");  
7     }  
8 }
```



```
1 package week10_9;  
2  
3 class Car extends Vehicle { 1 usage  
4     @Override 2 usages  
5     public void run() {  
6         System.out.println("Car is running.");  
7     }  
8 }  
9
```

Bike is running.  
Car is running.