OOPJ ASSIGNMENT – 3

Name – Nishant Nahar

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Section – CSE-25

1. Write a Java program to demonstrate a default constructor that initializes data members with default values.

```
class Demo {
  int a;
  String b;
  Demo() {
     a = 241551078;
     b = "Hello Nishant Here";
  }
  static void main(String[] args) {
     System.out.println("Nishant Nahar : 241551078");
     Demo a = new Demo();
     System.out.println(a.a + " " + a.b);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_1.java
Nishant Nahar : 241551078
241551078 Hello Nishant Here
```

2. Write a Java program using a parameterized constructor to initialize student details (roll, name, marks).

```
class Student_2 {
  int roll;
  String name;
  int marks;
  Student_2(int r, String n, int m) {
     roll = r;
     name = n;
     marks = m;
  }
  public static void main(String[] args) {
     System.out.println("nishant nahar 241551078");
     Student_2 s = new Student_2(1, "Amit", 90);
     System.out.println(s.roll + " " + s.name + " " + s.marks);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_2.java
nishant nahar 241551078
1 Amit 90
```

3. Create a class Employee with a constructor that takes employee id and salary and displays them.

```
class emp_01 {
```

```
  int id;
  double salary;
  emp_01(int i, double s) {
     id = i;
     salary = s;
  }
  public static void main(String[] args) {
     System.out.println("Nishant Nahar : 241551078");
     emp_01 e = new emp_01(1, 234560);
     emp_01 e1 = new emp_01(2, 75340);
     System.out.println("ID " + e.id + " Salary " + e.salary);
     System.out.println("ID " + e1.id + " Salary " + e1.salary);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4  main @ ~1  java .\assign_3.java
Nishant Nahar : 241551078
ID 1 Salary 234560.0
ID 2 Salary 75340.0
```

4. **Write a program to show constructor overloading using a Box class (cube and cuboid).**

```
class Box_2 {
  int area;
  Box_2(int a) {
     area = a * a;
  }
  Box_2(int l, int b) {
     area = l * b;
  }
  public static void main(String[] args) {
     System.out.println("Nishant Nahar : 241551078");
     Box_2 cube = new Box_2(3);
     Box_2 cuboid = new Box_2(2, 8);
     System.out.println("The area of cube is " + cube.area);
     System.out.println("The area of cuboid is " + cuboid.area);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4  main @ ~1  java assign_4.java
Nishant Nahar : 241551078
The area of cube is 9
The area of cuboid is 16
```

5. **Create a class Book with a constructor that calculates total price based on quantity and unit price**

```
class Book {
  double price_unit;
  int quantity;
  double total_price;
  Book(double p, int q) {
     price_unit = p;
     quantity = q;
     total_price = price_unit * quantity;
```

```
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar : 241551078");
    Book b1 = new Book(234.99, 20);
    Book b2 = new Book(560.87, 4);
    System.out.println("The total price of b1 is " + b1.total_price);
    System.out.println("The total price of b2 is " + b2.total_price);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main ~1 java .\assign_5.java
Nishant Nahar : 241551078
The total price of b1 is 4699.8
The total price of b2 is 2243.48
```

6. Write a Java program where a constructor counts the number of objects created.

```
class Count {
  static int count = 0; // so that it doesn't change back to 0
  Count() {
    count++;
  }
  public static void main(String[] args) {
    new Count();
    new Count();
    new Count();
    System.out.println(count);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main ~1 java .\assign_6.java
3
```

7. Demonstrate constructor chaining using multiple constructors in the same class.

```
class Chaining {
  Chaining() {
    this(90);
    System.out.println("Hello Guys");
  }
  Chaining(int a) {
    System.out.println(a);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new Chaining();
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main ~1 java .\assign_7.java
Nishant Nahar - 241551078
90
Hello Guys
```

8. Write a program to show the difference between constructor and method using execution order.

```java
class Diff {
  Diff() {
    System.out.println("It is a constructor");
  }
  void meth() {
    System.out.println("It is a method");
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    Diff d = new Diff();
    d.meth();
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_8.java
Nishant Nahar - 241551078
It is a constructor
It is a method
```

9. **Create a class Time with constructor to accept hours, minutes, seconds and normalize time.**

```java
class t {
  int h, m, s;
  t(int hr, int mi, int se) {
    s = se % 60;
    mi += se / 60;
    m = mi % 60;
    h = h + mi / 60;
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    t ti = new t(1, 70, 80);
    System.out.println(ti.h + ":" + ti.m + ":" + ti.s);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_9.java
Nishant Nahar - 241551078
1:11:20
```

10. **Write a Java program to initialize array elements using a constructor.**

```java
class arr {
  int a[];
  arr() {
    a = new int[] { 1, 2, 3 };
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    arr x = new arr();
    for (int i = 0; i < x.a.length; i++) {
      System.out.print(x.a[i] + " ");
    }
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4  main @ ~1  java .\assign_10.java
Nishant Nahar - 241551078
1 2 3
```

11. Write a program demonstrating use of this to distinguish instance variables from parameters.

```
class demo_1 {
  int x;
  demo_1(int x) {
    this.x = x;
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    demo_1 d = new demo_1(10);
    System.out.println(d.x);
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4  main @ ~1  java .\assign_11.java
Nishant Nahar - 241551078
10
```

12. Use this() to call another constructor within the same class.

```
class Cons {
  Cons() {
    this(34);
  }
  Cons(int x) {
    System.out.println(x);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new Cons();
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4  main @ ~1  java .\assign_12.java
Nishant Nahar - 241551078
34
```

13. Create a class where a method returns this reference.

```
class Ret {
  Ret get() {
    return this;
  }

  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    Ret r = new Ret();
    System.out.println(r.get());
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_13.java
Nishant Nahar - 241551078
Argu@51b279c9
```

14. Write a program to pass current object as method argument using this.

```
class Argu {
  void hello(Argu a) {
    System.out.println("Hello Ji");
  }
  void fail() {
    hello(this);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    Argu a = new Argu();
    a.fail();
  }
}
```

OUTPUT

```
B:\java_lab\assignment_4 main @ ~1 java .\assign_14.java
Nishant Nahar - 241551078
Hello Ji
```

15. Demonstrate method chaining using this.

```
class assign {
  assign a1() {
    System.out.println("a1");
    return this;
  }
  assign a2() {
    System.out.println("a2");
    return this;
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new assign().a1();
    new assign().a2();
  }
}
```

OUTPUT

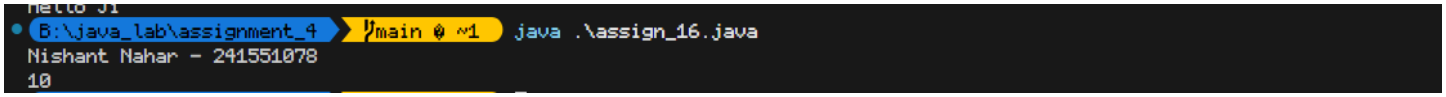
```
B:\java_lab\assignment_4 main @ ~1 java .\assign_15.java
Nishant Nahar - 241551078
a1
a2
```

16. Write a program showing how this improves code readability.

```
class A {
  int x;
  A(int x) {
    this.x = x;
  }
  void d() {
    System.out.println(x);
```

```
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    A o = new A(10);
    o.d();
  }
}
```

OUTPUT

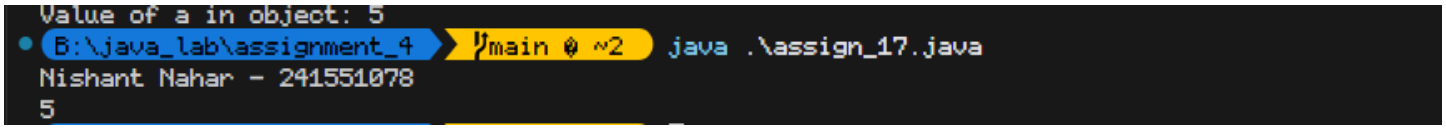


17. Use this keyword inside constructor to avoid variable shadowing.

```
class B {
  int a;
  B(int a) {
    this.a = a;
    System.out.println(this.a);

  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new B(5);
  }
}
```

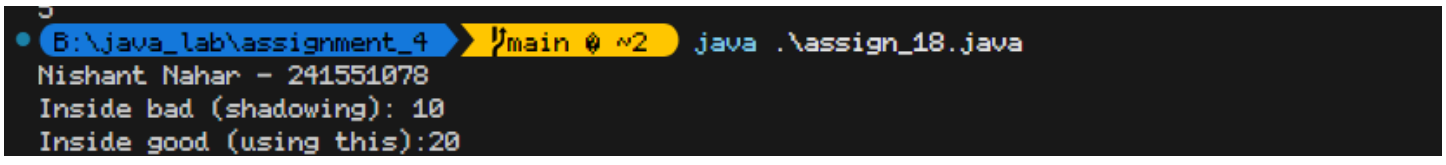
OUTPUT



18. Write a program to show incorrect behaviour without using this and correct it.

```
class C {
  int v;
  void bad(int v) {
    v = v;
    System.out.println("Inside bad (shadowing): " + v);
  }
  void good(int v) {
    this.v = v;
    System.out.println("Inside good (using this):" + this.v);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    C o = new C();
    o.bad(10);
    o.good(20);
  }
}
```

OUTPUT



19. Write a Java program to demonstrate single inheritance using Person and Student.

```
class Person {
  String n = "Nishant";
}
class stud extends Person {
  void d() {
    System.out.println(n);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new stud().d();
  }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~3   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Nishant
```

20.Create a program to show multilevel inheritance using Vehicle → Car → Electric Car.

```
class V {
  void type() {
    System.out.println("Vehicle");
  }
}

class Car extends V {
  void brand() {
    System.out.println("Car");
  }
}

class EC extends Car {
  void bat() {
    System.out.println("Electric Battery");
  }

  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    EC o = new EC();
    o.type();
    o.brand();
    o.bat();
  }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~3   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
oaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\redhat.java\jdt
Nishant Nahar - 241551078
Vehicle
Car
Electric Battery
```

21. Write a program showing constructor calling sequence in inheritance.

```java
class P {
  P() {
    System.out.println("Parent");
  }
}
class S extends P {
  S() {
    super();
    System.out.println("Child");
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    new S();
  }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~3   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Parent
Child
```

22. Write a Java program to demonstrate aggregation using Address and Employee.

```java
class Add {
  String c = "City";
}
class Emp {
  Add a;
  Emp(Add a) {
    this.a = a;
    System.out.println("Address value: " + a.c);
  }
  public static void main(String[] args) {
    System.out.println("Nishant Nahar - 241551078");
    Add ad = new Add();
    new Emp(ad);
  }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   b:; cd 'b:\java_lab'; & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
es' '-cp' 'C:\Users\nisha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Address value: City
```

23. Create a class Engine and aggregate it inside a Car class.

```java
class Eng {
  String t;
  Eng(String t) {
    this.t = t;
  }
}
class car_1 {
  String m;
```

```
  Eng e;
  car_1(String m, Eng e) {
     this.m = m;
     this.e = e;
  }
  void d() {
     System.out.println(m + " has " + e.t);
  }
  public static void main(String[] args) {
     System.out.println("Nishant Nahar - 241551078");
     Eng en = new Eng("V8");
     car_1 c = new car_1("Mustang", en);
     c.d();
  }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Mustang has V8
```

24.Write a program where a department has multiple Teacher objects.

```
class T {
   String n;
   T(String n) {
      this.n = n;
   }
}
class Dept {
   String d;
   T[] ts;
   Dept(String d, T[] ts) {
      this.d = d;
      this.ts = ts;
   }
   void list() {
      for (T t : ts)
         System.out.println(d + " : " + t.n);
   }
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      T[] arr = { new T("Amit"), new T("Sumit") };
      Dept d = new Dept("CS", arr);
      d.list();
   }
}
```

OUTPUT

```
Use 'show-help' to display help
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
CS : Amit
CS : Sumit
```

25. Demonstrate aggregation using array of objects inside another class.

```
class Obj {
   int id;
   Obj(int i) {
      id = i;
   }
}
class Box {
   Obj[] a;
   Box(Obj[] a) {
      this.a = a;
   }
   void show() {
      for (Obj obj : a) {
         System.out.println("ID: " + obj.id);
      }
   }
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      Obj[] list = { new Obj(1), new Obj(2) };
      new Box(list).show();
   }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
ID: 1
ID: 2
```

26. Write a program showing difference between inheritance and aggregation.

```
class Base {
   void run() {
      System.out.println("Running");
   }
}
class Inh extends Base {
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      new Inh().run();
      new Agg().b.run();
   }
}
class Agg {
   Base b = new Base();
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\rec
Nishant Nahar - 241551078
Running
Running
```

27. Create a college class that contains Student objects using aggregation.

```java
class Stu {
   String n;
   Stu(String n) {
      this.n = n;
   }
}
class Col {
   Stu[] s;
   Col(Stu[] s) {
      this.s = s;
   }
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      Stu[] list = { new Stu("S1"), new Stu("S2") };
      Col c = new Col(list);
      for (Stu student : c.s) {
         System.out.println(student.n);
      }
   }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
S1
S2
```

28. Write a program to show HAS-A relationship using aggregation.

```java
class CPU {
   void op() {
      System.out.println("CPU Op");
   }
}
class PC {
   CPU c = new CPU();
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      PC p = new PC();
      p.c.op();
   }
}
```

OUTPUT

```
Use 'show-help' to display help
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
CPU Op
```

29. Demonstrate aggregation with constructor-based object passing.

```java
class Tool {
   String type;
   Tool(String t) {
      type = t;
   }
```

```
}
class Worker {
   Tool t;
   Worker(Tool t) {
      this.t = t;
   }

   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      Worker w = new Worker(new Tool("Drill"));
      System.out.println(w.t.type);
   }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Drill
```

30. Write a program where destroying parent object does not destroy aggregated object.

```
class Part {
   void show() {
      System.out.println("Part is alive");
   }
}
class Whole {
   Part p;
   Whole(Part p) {
      this.p = p;
   }
}
public class assign_30 {
   public static void main(String[] args) {
      System.out.println("Nishant Nahar - 241551078");
      Part part = new Part();
      Whole whole = new Whole(part);
      whole.p.show();
      whole = null;
      part.show();
   }
}
```

OUTPUT

```
B:\java_lab  main @ ?1 ~4   & 'C:\Program Files\Java\jdk-25\bin\java.exe' '--enable-
sha\AppData\Roaming\Antigravity\User\workspaceStorage\eec1571208ddd9a5447730cd2b52d6f0\re
Nishant Nahar - 241551078
Part is alive
Part is alive
```