



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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Experiment - 2

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Section/Group: KRG-2B

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Subject Name: Project Based Learning in Java

Subject Code: 23CSH-304

Aim: To develop Java programs to manage product details, library systems, and student information using classes, inheritance, and abstraction.

Easy-level Problem-

Aim: To write a Java program to create a Product class with attributes id, name and price. The program should:

- Demonstrate the use of constructors and methods to display product details.

Objective: To understand use of classes, constructors and methods in Java using concepts like Java class definition, constructor and method usage.

Procedure:

1. Define a class named 'Product' with attributes 'id', 'name' and 'price'.
2. Use a parameterized constructor to initialize these attributes.
3. Define a method 'displayDetails()' to print product information.
4. In the main method, create an object and display its details.

Sample Input Product

ID: 101

Name: Laptop

Price: 75000

Sample Output -

Product Details:

ID: 101

Name: Laptop

Price: 75000

Code -

```
package exp2;

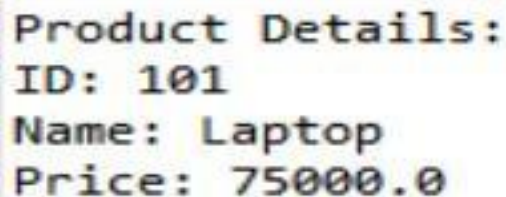
class Product {
    int id; String
    name; double
    price;

    // Parameterized constructor Product(int id,
    String name, double price) { this.id = id;
    this.name = name; this.price = price; }

    // Method to display details void
    displayDetails() {
        System.out.println("Product Details:");
        System.out.println("ID: " + id);
        System.out.println("Name: " + name);
        System.out.println("Price: " + price);
    }
}

public class easy {
    public static void main(String[] args) {
        // Creating product object
        Product p1 = new Product(101, "Laptop", 75000);
        p1.displayDetails();
    }
}
```

Output -



```
Product Details:
ID: 101
Name: Laptop
Price: 75000.0
```

Medium- Level Problem -

Aim : To write a Java program to implement a library management system. The program should :

- Use a base class Book and derived classes Fiction and NonFiction.



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Objective: Understand inheritance and dynamic method invocation in Java using concepts of Java inheritance using base and derived classes.

Procedure:

1. Define a base class 'Book' with common attributes like title, author and price.
2. Create two derived classes: 'Fiction' and 'NonFiction' extending the 'Book' class.
3. Override method in each subclass to display respective book details.
4. Instantiate objects of each subclass and invoke their display methods.

Sample Input :

Book 1:

Type: Fiction

Title: Harry Potter

Author: J.K. Rowling

Price: 500

Book 2:

Type: Non-Fiction

Title: Sapiens

Author: Yuval Noah Harari

Price: 700

Sample Output:

Fiction Book Details:

Title: Harry Potter

Author: J.K. Rowling

Price: 500

Non-Fiction Book Details:

Title: Sapiens

Author: Yuval Noah Harari

Price: 700 **Code :**

```
// Base class  
package exp2;
```



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```
class Book { String
title, author;
double price;

Book(String title, String author, double price) {
this.title = title; this.author = author;
this.price = price;
}

void displayDetails() {
System.out.println("Book Details:");
System.out.println("Title: " + title);
System.out.println("Author: " + author);
System.out.println("Price: " + price);
}
}

// Derived class Fiction
class Fiction extends Book {
Fiction(String title, String author, double price) {
super(title, author, price); }

@Override void
displayDetails() {
System.out.println("Fiction Book Details:");
System.out.println("Title: " + title);
System.out.println("Author: " + author);
System.out.println("Price: " + price);
}
}

// Derived class NonFiction
class NonFiction extends Book {
NonFiction(String title, String author, double price) {
super(title, author, price); }

@Override void
displayDetails() {
System.out.println("Non
-Fiction Book
Details:");
System.out.println("Title: " + title);
System.out.println("Author: " + author);
System.out.println("Price: " + price);
}
}

public class medium {
```

```
public static void main(String[] args) {  
    Fiction f1 = new Fiction("Harry Potter", "J.K. Rowling", 500);  
    NonFiction nf1 = new NonFiction("Sapiens", "Yuval Noah Harari", 700);  
  
    f1.displayDetails();  
    System.out.println();  
    nf1.displayDetails();  
}
```

Output:

```
Fiction Book Details:  
Title: Harry Potter  
Author: J.K. Rowling  
Price: 500.0  
  
Non-Fiction Book Details:  
Title: Sapiens  
Author: Yuval Noah Harari  
Price: 700.0
```

Hard -level Problem-

Aim : To design a student information system using Java with following features:

- Use an abstract class Person with attributes name, age and methods like displayDetails().
- Create derived classes Student and Teacher to override displayDetails() and add unique attributes like rollNumber for students and subject for teachers.

Objective: Demonstrate abstraction and polymorphism using abstract classes and derived classes using Java concepts of abstract classes, inheritance and overriding .

Procedure:

1. Define an abstract class 'Person' with attributes 'name' and 'age', and an abstract method 'displayDetails()'.
2. Create a 'Student' class extending 'Person', with an additional attribute 'rollNumber', and implement 'displayDetails()'.



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3. Create a 'Teacher' class extending 'Person' with an additional attribute 'subject' and implement 'displayDetails()'.
4. In the main method, create objects of 'Student' and 'Teacher' and invoke 'displayDetails()' on each.

Sample Input:

Add Student:

Name: Alice

Age: 20 Roll

Number: 101

Add Teacher:

Name: Mr. Smith

Age: 40

Subject: Mathematics

Sample Output:

Student Details:

Name: Alice

Age: 20 Roll

Number: 101

Teacher Details:

Name: Mr. Smith

Age: 40

Subject: Mathematics

Code :

```
// Abstract class
package exp2;

abstract class Person {
    String name; int age;

    Person(String name, int age) {
        this.name = name; this.age =
        age; }
}
```



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```
// Abstract method abstract
void displayDetails(); }

// Student class class Student extends Person { int rollNumber;

Student(String name, int age, int rollNumber) {
super(name, age);
this.rollNumber = rollNumber;
}

@Override void displayDetails() {
System.out.println("Student Details:");
System.out.println("Name: " + name);
System.out.println("Age: " + age);
System.out.println("Roll Number: " + rollNumber);
}
}

// Teacher class class Teacher
extends Person { String
subject;

Teacher(String name, int age, String subject) {
super(name, age);
this.subject = subject;
}

@Override void
displayDetails() {
System.out.println("Teacher Details:");
System.out.println("Name: " + name);
System.out.println("Age: " + age);
System.out.println("Subject: " + subject);
}
}

public class hard { public static void
main(String[] args) { Student s1 = new
Student("Alice", 20, 101);
Teacher t1 = new Teacher("Mr. Smith", 40, "Mathematics");

s1.displayDetails();
System.out.println();
t1.displayDetails();
}
}
```



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Output:

```
terminated/ java Applica
Student Details:
Name: Alice
Age: 20
Roll Number: 101

Teacher Details:
Name: Mr. Smith
Age: 40
Subject: Mathematics
```