Name: Rishabh Pandey

Roll Number: 87

Subject: Java-Practical

Course: 5 Years M.Sc CS

Semester: 5

1. Create a Class and Object

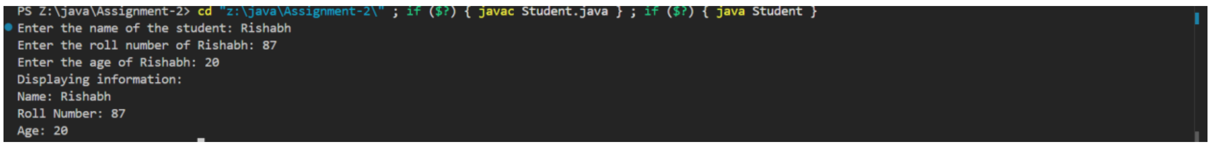
o Define a Student class with attributes (name, rollNo), create objects and display

details.

Code:-

```
import java.util.Scanner;

public class Student {

    private String name;
    private int rollNo;
    private int age;

    public Student(String name, int rollNo, int age) {
        this.name = name;
        this.rollNo = rollNo;
        this.age = age;
    }

    public void setName(String name) {
        this.name = name;
    }

    public void setRollNo(int rollNo) {
        this.rollNo = rollNo;
    }

    public void setAge(int age) {
        this.age = age;
    }

    public String getName() {
        return this.name;
    }

    public int getRollNo() {
        return this.rollNo;
    }

    public int getAge() {
        return this.age;
    }

    public void display() {
        System.out.println("Name: " + this.name + "\nRoll Number: " + this.rollNo + "\nAge: " +
this.age);
    }
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the name of the student: ");
        String name = scanner.next();
        System.out.print("Enter the roll number of " + name + ": ");
        int rollNo = scanner.nextInt();
        System.out.print("Enter the age of " + name + ": ");
        int age = scanner.nextInt();
        scanner.close();

        Student student = new Student(name, rollNo, age);
        System.out.println("Displaying information: ");
        student.display();
    }

}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Student.java } ; if ($?) { java Student }
Enter the name of the student: Rishabh
Enter the roll number of Rishabh: 87
Enter the age of Rishabh: 20
Displaying information:
Name: Rishabh
Roll Number: 87
Age: 20
```

2. Constructor Example

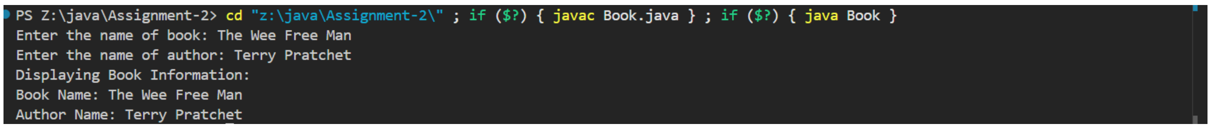
o Create a Book class with a constructor to initialize book name and author, and a

method to display them.

Code:-

```
import java.util.Scanner;

public class Book {
    private String bookName;
    private String authorName;

    public Book(String bookName, String authorName) {
        this.bookName = bookName;
        this.authorName = authorName;
    }

    public void display() {
        System.out.println("Book Name: " + this.bookName + "\nAuthor Name: " + this.authorName);
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the name of book: ");
        String bookName = scanner.nextLine();
        System.out.print("Enter the name of author: ");
        String authorName = scanner.nextLine();
        scanner.close();

        Book book = new Book(bookName, authorName);
        System.out.println("Displaying Book Information: ");
        book.display();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Book.java } ; if ($?) { java Book }
Enter the name of book: The Wee Free Man
Enter the name of author: Terry Pratchet
Displaying Book Information:
Book Name: The Wee Free Man
Author Name: Terry Pratchet
```

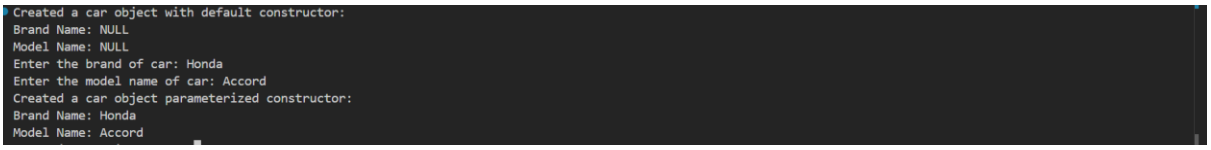
3. Default and Parameterized Constructor

o Car class with two constructors: one default and one parameterized.

Code:-

```
import java.util.Scanner;

public class Car {
    private String brandName;
    private String modelName;

    public Car() {
        this.brandName = "NULL";
        this.modelName = "NULL";
    }

    public Car(String brandName, String modelName) {
        this.brandName = brandName;
        this.modelName = modelName;
    }

    public void display() {
        System.out.println("Brand Name: " + this.brandName + "\nModel Name: " + this.modelName);
    }

    public static void main(String[] args) {
        Car car1 = new Car();

        System.out.println("Created a car object with default constructor: ");
        car1.display();

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the brand of car: ");
        String brandName = scanner.nextLine();
        System.out.print("Enter the model name of car: ");
        String modelName = scanner.nextLine();
        scanner.close();

        Car car2 = new Car(brandName, modelName);
        System.out.println("Created a car object parameterized constructor: ");
        car2.display();
    }
}
```

Output:-



```
Created a car object with default constructor:
Brand Name: NULL
Model Name: NULL
Enter the brand of car: Honda
Enter the model name of car: Accord
Created a car object parameterized constructor:
Brand Name: Honda
Model Name: Accord
```

4. Function Overloading

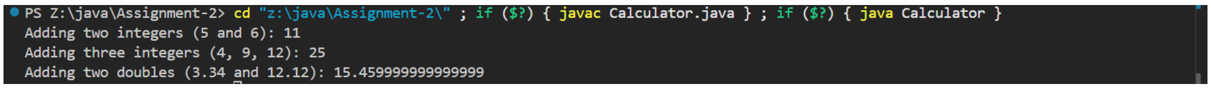
o Calculator class with multiple add() methods:

 add(int, int), add(double, double), add(int, int, int)

Code:-

```
public class Calculator {
    public static int add(int a, int b) {
        return a + b;
    }

    public static int add(int a, int b, int c) {
        return a + b + c;
    }

    public static double add(double a, double b) {
        return a + b;
    }

    public static void main(String[] args) {
        System.out.println("Adding two integers (5 and 6): " + Calculator.add(5, 6));
        System.out.println("Adding three integers (4, 9, 12): " + Calculator.add(4, 9, 12));
        System.out.println("Adding two doubles (3.34 and 12.12): " + Calculator.add(3.34, 12.12));
    }
}
```

Output:-


```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Calculator.java } ; if ($?) { java Calculator }
Adding two integers (5 and 6): 11
Adding three integers (4, 9, 12): 25
Adding two doubles (3.34 and 12.12): 15.459999999999999
```

5. Constructor Overloading

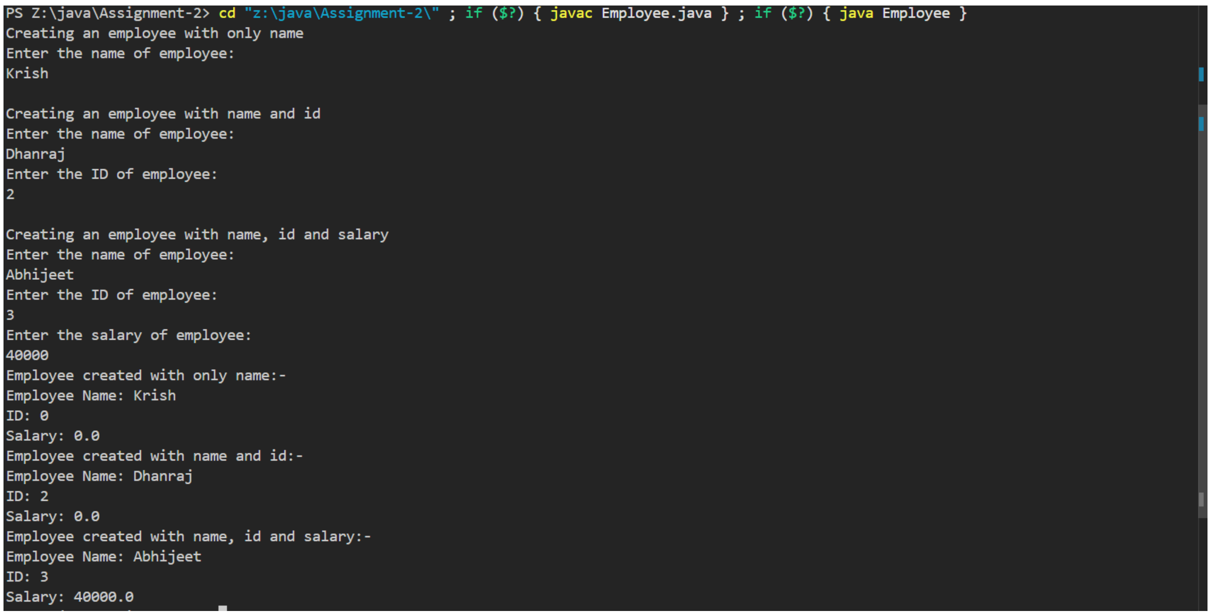
o Employee class with overloaded constructors to initialize with different sets of

data (e.g., name only, name and id, name, id, and salary).

Code:-

```
import java.util.Scanner;

public class Employee {
    private int id;
    private String name;
    private double salary;

    public Employee(String name) {
        this(name, 0, 0.0);
    }

    public Employee(String name, int id) {
        this(name, id, 0.0);
    }

    public Employee(String name, int id, double salary) {
        if (salary < 0) {
            throw new ArithmeticException("Salary cannot be less than 0");
        }
        this.name = name;
        this.id = id;
        this.salary = salary;
    }

    public void display() {
        System.out.println("Employee Name: " + this.name + "\nID: " + this.id + "\nSalary: " +
this.salary);
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Creating an employee with only name\nEnter the name of employee: ");
        String name = scanner.nextLine();
        Employee emp1 = new Employee(name);
        System.out.println("\nCreating an employee with name and id\nEnter the name of employee: ");
        name = scanner.nextLine();
        System.out.println("Enter the ID of employee: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        Employee emp2 = new Employee(name, id);
        System.out.println("\nCreating an employee with name, id and salary\nEnter the name of
employee: ");
        name = scanner.nextLine();
        System.out.println("Enter the ID of employee: ");
        id = scanner.nextInt();
        System.out.println("Enter the salary of employee: ");
        double salary = scanner.nextDouble();
        Employee emp3 = new Employee(name, id, salary);
        scanner.close();

        System.out.println("Employee created with only name:-");
        emp1.display();
        System.out.println("Employee created with name and id:-");
        emp2.display();
        System.out.println("Employee created with name, id and salary:-");
        emp3.display();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Employee.java } ; if ($?) { java Employee }
Creating an employee with only name
Enter the name of employee:
Krish

Creating an employee with name and id
Enter the name of employee:
Dhanraj
Enter the ID of employee:
2

Creating an employee with name, id and salary
Enter the name of employee:
Abhijeet
Enter the ID of employee:
3
Enter the salary of employee:
40000
Employee created with only name:-
Employee Name: Krish
ID: 0
Salary: 0.0
Employee created with name and id:-
Employee Name: Dhanraj
ID: 2
Salary: 0.0
Employee created with name, id and salary:-
Employee Name: Abhijeet
ID: 3
Salary: 40000.0
```

6. Class with Method to Calculate Area

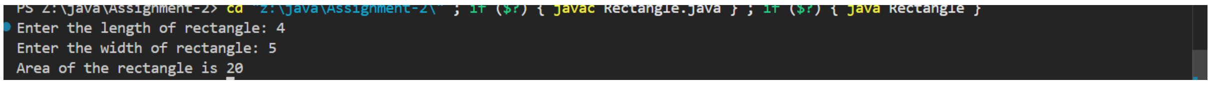
o Create a Rectangle class with length and width, and a method

calculateArea().

Code:-

```
import java.util.Scanner;

public class Rectangle {
    private int length;
    private int width;
    public Rectangle(int length, int width) {
        this.length = length;
        this.width = width;
    }

    public int calculateArea() {
        return this.length * this.width;
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the length of rectangle: ");
        int length = scanner.nextInt();
        System.out.print("Enter the width of rectangle: ");
        int width = scanner.nextInt();
        scanner.close();

        Rectangle rectangle = new Rectangle(length, width);

        System.out.println("Area of the rectangle is " + rectangle.calculateArea());
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "Z:\java\Assignment-2\" ; if ($?) { javac Rectangle.java } ; if ($?) { java Rectangle }
Enter the length of rectangle: 4
Enter the width of rectangle: 5
Area of the rectangle is 20
```

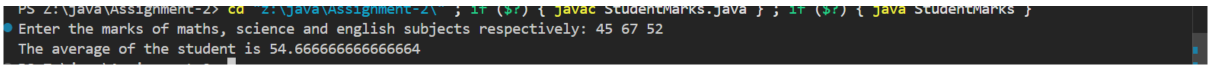
7. Student Class with Marks and Average

o Accept marks of 3 subjects using constructor, calculate average using method.

Code:-

```
import java.util.Scanner;

public class StudentMarks {

    private int mathsMarks;
    private int scienceMarks;
    private int englishMarks;

    public StudentMarks(int mathsMarks, int scienceMarks, int englishMarks) {
        this.mathsMarks = mathsMarks;
        this.scienceMarks = scienceMarks;
        this.englishMarks = englishMarks;
    }

    public double getAverage() {
        return (this.mathsMarks + this.scienceMarks + this.englishMarks) / 3.0;
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the marks of maths, science and english subjects respectively: ");
        int mathsMarks = scanner.nextInt();
        int scienceMarks = scanner.nextInt();
        int englishMarks = scanner.nextInt();
        scanner.close();

        StudentMarks studentMarks = new StudentMarks(mathsMarks, scienceMarks, englishMarks);
        System.out.println("The average of the student is " + studentMarks.getAverage());
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "Z:\java\Assignment-2\" ; if ($?) { javac StudentMarks.java } ; if ($?) { java StudentMarks }
Enter the marks of maths, science and english subjects respectively: 45 67 52
The average of the student is 54.666666666666664
```

8. Bank Account Class

o Class BankAccount with deposit, withdraw, and showBalance methods; use

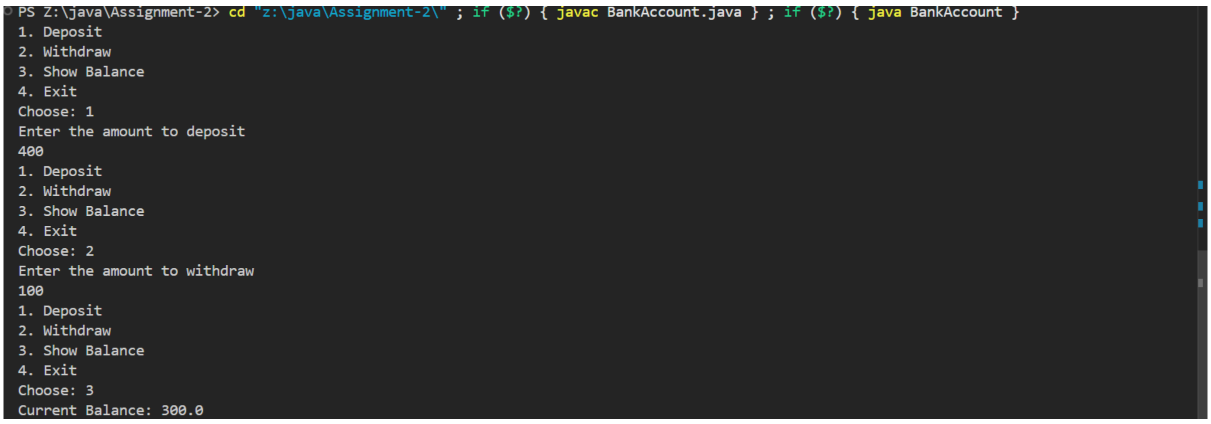
constructors to initialize account.

Code:-

```
import java.util.Scanner;

class InvalidDeposit extends Exception {
    public InvalidDeposit(String message) {
        super(message);
    }
}

class InvalidWithdraw extends Exception {
    public InvalidWithdraw(String message) {
        super(message);
    }
}

public class BankAccount {

    private double balance;

    public BankAccount(double balance) {
        this.balance = balance;
    }

    public void depositAmount(double depositAmount) throws InvalidDeposit {
        if (depositAmount < 0) {
            throw new InvalidDeposit("Deposit amount cannot be negative");
        }

        this.balance += depositAmount;
    }

    public void withdrawAmount(double withdrawAmount) throws InvalidWithdraw {
        if (withdrawAmount < 0) {
            throw new InvalidWithdraw("Withdrawn amount cannot be negative");
        }

        if (this.balance < withdrawAmount) {
            throw new InvalidWithdraw("Not enough balance in the account");
        }

        this.balance -= withdrawAmount;
    }

    public void showBalance() {
        System.out.println("Current Balance: " + this.balance);
    }

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        BankAccount bankAccount = new BankAccount(0);

        boolean continueLoop = true;

        while (continueLoop) {
            System.out.print("1. Deposit\n2. Withdraw\n3. Show Balance\n4. Exit\nChoose: ");
            int choice = scanner.nextInt();

            switch (choice) {
                case 1:
                    System.out.println("Enter the amount to deposit");
                    int depositAmount = scanner.nextInt();

                    try {
                        bankAccount.depositAmount(depositAmount);
                    } catch (InvalidDeposit e) {
                        System.out.println("Error: " + e.getMessage());
                    }
                    break;

                case 2:
                    System.out.println("Enter the amount to withdraw");
                    int withdrawAmount = scanner.nextInt();

                    try {
```

```
                bankAccount.withdrawAmount(withdrawAmount);
            } catch (InvalidWithdraw e) {
                System.out.println("Error: " + e.getMessage());
            }
            break;

        case 3:
            bankAccount.showBalance();
            break;

        case 4:
            continueLoop = false;
            break;

        default:
            System.out.println("Invalid Option!");
        }
    }
    scanner.close();
  }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac BankAccount.java } ; if ($?) { java BankAccount }
1. Deposit
2. Withdraw
3. Show Balance
4. Exit
Choose: 1
Enter the amount to deposit
400
1. Deposit
2. Withdraw
3. Show Balance
4. Exit
Choose: 2
Enter the amount to withdraw
100
1. Deposit
2. Withdraw
3. Show Balance
4. Exit
Choose: 3
Current Balance: 300.0
```

9. Class with Object as a Member

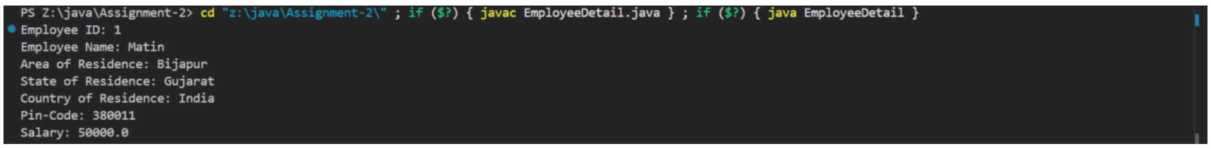
o Create Address and Employee classes. Employee has an Address object as a

member.

Code:-

```
class Address {

    private String area;
    private String state;
    private String country;
    private long pinCode;

    public Address(String area, String state, String country, long pinCode) {
        this.area = area;
        this.state = state;
        this.country = country;
        this.pinCode = pinCode;
    }

    public String getArea() {
        return this.area;
    }

    public String getState() {
        return this.state;
    }

    public String getCountry() {
        return this.country;
    }

    public long getPinCode() {
        return this.pinCode;
    }
}

public class EmployeeDetail {
    private int empId;
    private String empName;
    private Address empAddress;
    private double empSalary;

    public EmployeeDetail(int id, String name, String area, String state, String country, long pinCode,
double salary) {
        this.empId = id;
        this.empName = name;
        this.empAddress = new Address(area, state, country, pinCode);
        this.empSalary = salary;
    }

    public void display() {
        System.out.println("Employee ID: " + this.empId + "\nEmployee Name: " + this.empName +
                        "\nArea of Residence: " + this.empAddress.getArea() +
                        "\nState of Residence: " + this.empAddress.getState() +
                        "\nCountry of Residence: " + this.empAddress.getCountry() +
                        "\nPin-Code: " + this.empAddress.getPinCode() +
                        "\nSalary: " + this.empSalary);
    }

    public static void main(String[] args) {
        EmployeeDetail empDetail = new EmployeeDetail(1, "Matin", "Bijapur", "Gujarat", "India",
380011, 50000);

        empDetail.display();
    }

}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac EmployeeDetail.java } ; if ($?) { java EmployeeDetail }
Employee ID: 1
Employee Name: Matin
Area of Residence: Bijapur
State of Residence: Gujarat
Country of Residence: India
Pin-Code: 380011
Salary: 50000.0
```

10.Function Overloading in Constructor and Method

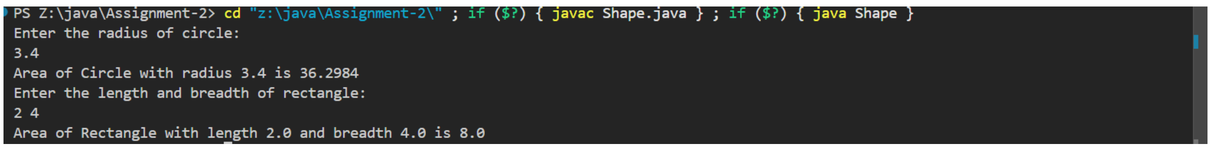
 Shape class with overloaded constructors for circle and rectangle. Also overload

area() method to handle both shapes.

Code:-

```
import java.util.Scanner;

public class Shape {
    private double radius;
    private double length;
    private double breadth;

    public Shape(double radius) {
        this.radius = radius;
        this.length = this.breadth = -1;
        this.area(this.radius);
    }

    public Shape(double length, double breadth) {
        this.length = length;
        this.breadth = breadth;
        this.radius = -1;
        this.area(this.length, this.breadth);
    }

    public void area(double radius) {
        System.out.println("Area of Circle with radius " + radius + " is " + 3.14 * radius * radius);
    }

    public void area(double length, double breadth) {
        System.out.println("Area of Rectangle with length " + length + " and breadth " + breadth + " is "
+ (length * breadth));
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter the radius of circle: ");
        double r = scanner.nextDouble();
        Shape circle = new Shape(r);

        System.out.println("Enter the length and breadth of rectangle: ");
        double l = scanner.nextDouble();
        double b = scanner.nextDouble();
        Shape rectangle = new Shape(l, b);
        scanner.close();

    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Shape.java } ; if ($?) { java Shape }
Enter the radius of circle:
3.4
Area of Circle with radius 3.4 is 36.2984
Enter the length and breadth of rectangle:
2 4
Area of Rectangle with length 2.0 and breadth 4.0 is 8.0
```

11.Class with Private Members and Public Getters/Setters

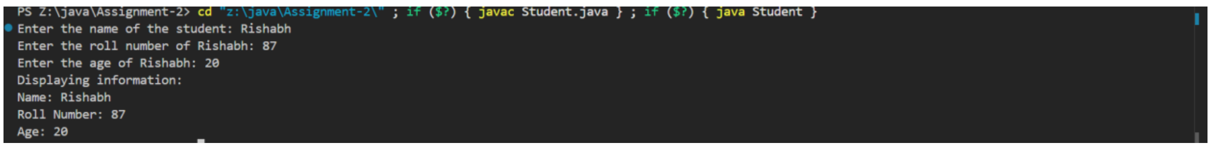
 Student class with private fields (name, age) and public methods to access them using

getter/setter methods. Use constructor to initialize.

Code:-

```
import java.util.Scanner;

public class Student {

    private String name;
    private int rollNo;
    private int age;

    public Student(String name, int rollNo, int age) {
        this.name = name;
        this.rollNo = rollNo;
        this.age = age;
    }

    public void setName(String name) {
        this.name = name;
    }

    public void setRollNo(int rollNo) {
        this.rollNo = rollNo;
    }

    public void setAge(int age) {
        this.age = age;
    }
    public String getName() {
        return this.name;
    }

    public int getRollNo() {
        return this.rollNo;
    }

    public int getAge() {
        return this.age;
    }

    public void display() {
        System.out.println("Name: " + this.name + "\nRoll Number: " + this.rollNo + "\nAge: " +
this.age);
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the name of the student: ");
        String name = scanner.next();
        System.out.print("Enter the roll number of " + name + ": ");
        int rollNo = scanner.nextInt();
        System.out.print("Enter the age of " + name + ": ");
        int age = scanner.nextInt();
        scanner.close();

        Student student = new Student(name, rollNo, age);
        System.out.println("Displaying information: ");
        student.display();
    }

}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Student.java } ; if ($?) { java Student }
Enter the name of the student: Rishabh
Enter the roll number of Rishabh: 87
Enter the age of Rishabh: 20
Displaying information:
Name: Rishabh
Roll Number: 87
Age: 20
```

12.Array of Objects

 Create a Product class and an array of Product objects. Accept data and display all

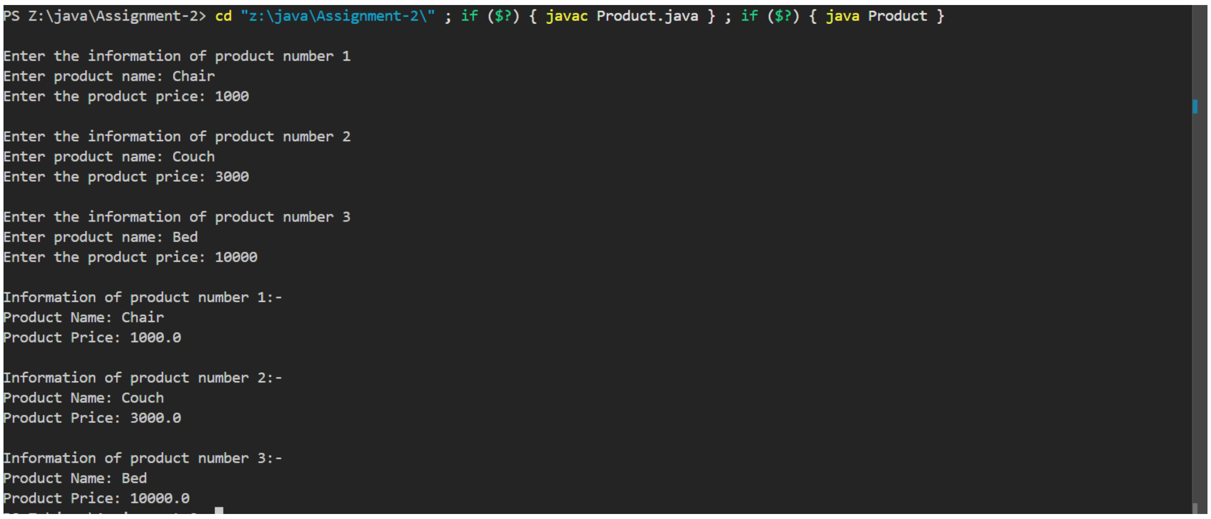
products using loop.

Code:-

```
import java.util.Scanner;
```

```
public class Product {
   private String productName;
   private double productPrice;

   public Product(String productName, double productPrice) {
      this.productName = productName;
      this.productPrice = productPrice;
   }

   public void display() {
      System.out.println("Product Name: " + this.productName + "\nProduct Price: " +
this.productPrice);
   }

   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      Product []products = new Product[3];
      for (int i = 0; i < products.length; i++) {
         System.out.println("\nEnter the information of product number " + (i + 1));
         System.out.print("Enter product name: ");
         String name = scanner.nextLine();
         System.out.print("Enter the product price: ");
         double price = scanner.nextDouble();
         scanner.nextLine();

         products[i] = new Product(name, price);
      }
      scanner.close();

      for (int i = 0; i < products.length; i++) {
         System.out.println("\nInformation of product number " + (i + 1) + ":-");
         products[i].display();
      }
   }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Product.java } ; if ($?) { java Product }

Enter the information of product number 1
Enter product name: Chair
Enter the product price: 1000

Enter the information of product number 2
Enter product name: Couch
Enter the product price: 3000

Enter the information of product number 3
Enter product name: Bed
Enter the product price: 10000

Information of product number 1:-
Product Name: Chair
Product Price: 1000.0

Information of product number 2:-
Product Name: Couch
Product Price: 3000.0

Information of product number 3:-
Product Name: Bed
Product Price: 10000.0
```

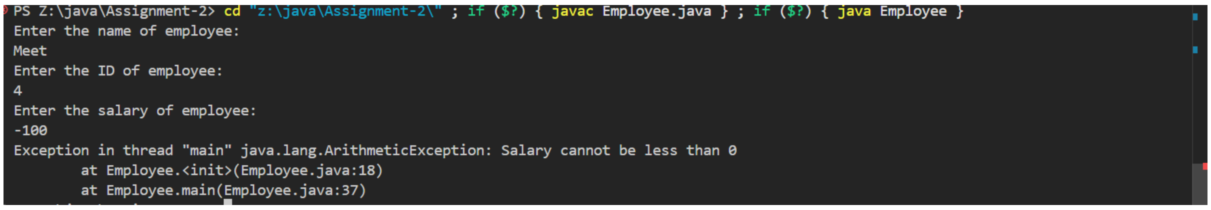
13.Constructor with Validation using Exception

 Employee constructor throws an exception if salary is negative.

Code:-

```
import java.util.Scanner;

public class Employee {
  private int id;
  private String name;
  private double salary;

  public Employee(String name) {
    this(name, 0, 0.0);
  }

  public Employee(String name, int id) {
    this(name, id, 0.0);
  }

  public Employee(String name, int id, double salary) {
    if (salary < 0) {
      throw new ArithmeticException("Salary cannot be less than 0");
    }
    this.name = name;
    this.id = id;
    this.salary = salary;
  }

  public void display() {
    System.out.println("Employee Name: " + this.name + "\nID: " + this.id + "\nSalary: " +
this.salary);
  }

  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter the name of employee: ");
    String name = scanner.nextLine();
    System.out.println("Enter the ID of employee: ");
    int id = scanner.nextInt();
    System.out.println("Enter the salary of employee: ");
    double salary = scanner.nextDouble();
    Employee emp3 = new Employee(name, id, salary);
    scanner.close();
    System.out.println("Employee created with name, id and salary:-");
    emp3.display();
  }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Employee.java } ; if ($?) { java Employee }
Enter the name of employee:
Meet
Enter the ID of employee:
4
Enter the salary of employee:
-100
Exception in thread "main" java.lang.ArithmeticException: Salary cannot be less than 0
        at Employee.<init>(Employee.java:18)
        at Employee.main(Employee.java:37)
```

14.Custom Exception Handling

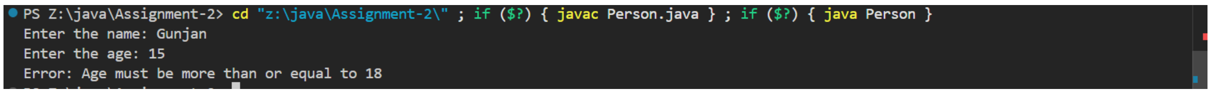
 Create a custom exception InvalidAgeException. Throw it if age < 18 in a method

checkEligibility().

Code:-

```
import java.util.Scanner;

class InvalidAgeException extends Exception {
    public InvalidAgeException(String message) {
        super(message);
    }
}

public class Person {
    private String name;
    private int age;

    public Person(String name, int age) throws InvalidAgeException {
        if (age < 18) {
            throw new InvalidAgeException("Age must be more than or equal to 18");
        }
        this.name = name;
        this.age = age;
    }

    public void display() {
        System.out.println("Name: " + this.name + "\nAge: " + this.age);
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the name: ");
        String name = scanner.nextLine();
        System.out.print("Enter the age: ");
        int age = scanner.nextInt();
        scanner.close();

        try {
            Person person = new Person(name, age);
            person.display();
        } catch (InvalidAgeException e) {
            System.out.println("Error: " + e.getMessage());
        }
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Person.java } ; if ($?) { java Person }
Enter the name: Gunjan
Enter the age: 15
Error: Age must be more than or equal to 18
```

15.Static vs Non-static Members

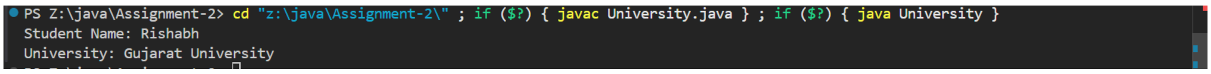
 University class with static universityName and non-static studentName.

Demonstrate calling static vs non-static members.

Code:-

```
import java.util.Scanner;

public class University {
    public final static String universityName = "Gujarat University";
    private String studentName;

    public University(String name) {
        this.studentName = name;
    }

    public void display() {
        System.out.println("Student Name: " + this.studentName + "\nUniversity: " +
University.universityName);
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        University student = new University("Rishabh");
        scanner.close();
        student.display();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac University.java } ; if ($?) { java University }
Student Name: Rishabh
University: Gujarat University
```

16.Multiple Classes with Relationships

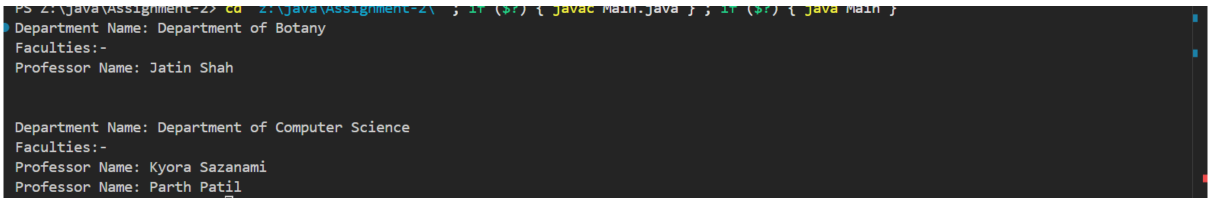
 Department and Professor class. Each Professor is linked to a Department object.

Code:-

```
class Department {
   private String departmentName;
   private Professor []professors;
   private int professorCount;

   public Department(String name) {
      this.departmentName = name;
      this.professors = new Professor[5];
      this.professorCount = 0;
   }

   public void addProfessor(Professor professor) {
      this.professors[this.professorCount++] = professor;
   }

   public void display() {
      System.out.println("Department Name: " + this.departmentName);
      System.out.println("Faculties:- ");
      for (int i = 0; i < this.professorCount; i++) {
         this.professors[i].display();
      }
   }

}

class Professor {
   private String professorName;
   private Department department;

   public Professor(String name, Department department) {
      this.professorName = name;
      this.department = department;
      department.addProfessor(this);
   }

   public void display() {
      System.out.println("Professor Name: " + this.professorName);
   }
}

public class Main {
   public static void main(String[] args) {
      Department dept1 = new Department("Department of Botany");
      Department dept2 = new Department("Department of Computer Science");

      Professor prof1 = new Professor("Jatin Shah", dept1);
```

```
        Professor prof2 = new Professor("Kyora Sazanami", dept2);
        Professor prof3 = new Professor("Parth Patil", dept2);

        dept1.display();
        System.out.println("\n");
        dept2.display();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Main.java } ; if ($?) { java Main }
Department Name: Department of Botany
Faculties:-
Professor Name: Jatin Shah


Department Name: Department of Computer Science
Faculties:-
Professor Name: Kyora Sazanami
Professor Name: Parth Patil
```

17.Array of Objects with Total Calculation

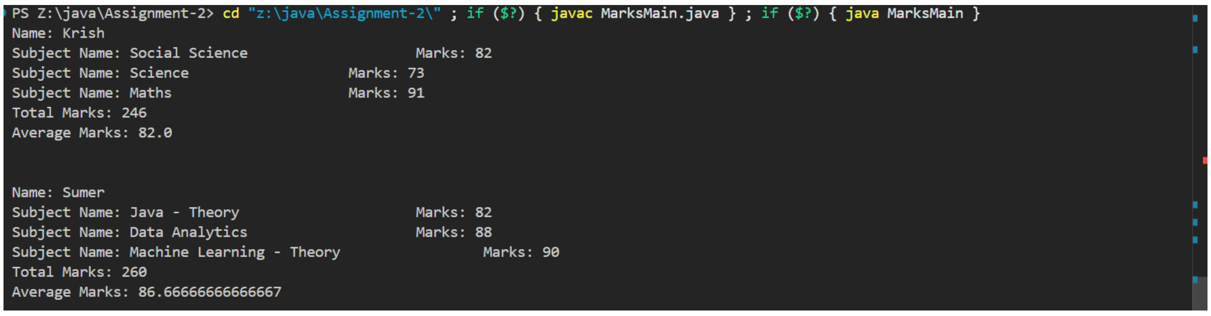
 Marks class having subject marks, use array of students to calculate and display total

and average marks.

Code:-

```
class Marks {
    private String subjectName;
    private int marks;

    public Marks(String subjectName, int marks) {
        this.subjectName = subjectName;
        this.marks = marks;
    }

    public String getSubjectName() {
        return this.subjectName;
    }

    public int getMarks() {
        return this.marks;
    }
}

class Student {

    private String studentName;
    private Marks[] marks;

    public Student(String name, Marks[] marks) {
        this.studentName = name;
        this.marks = marks;
    }
    public void display() {
        System.out.println("Name: " + this.studentName);
        for (Marks mark : marks) {
            System.out.println("Subject Name: " + mark.getSubjectName() + "\t\t\tMarks: " +
mark.getMarks());
        }
        System.out.println("Total Marks: " + this.getTotalMarks() + "\nAverage Marks: " +
this.getAverageMarks());
    }

    public int getTotalMarks() {
        int sum = 0;
        for (Marks mark : marks) {
            sum += mark.getMarks();
        }
        return sum;
    }

    public double getAverageMarks() {
        return (double) this.getTotalMarks() / this.marks.length;
    }
}

public class MarksMain {
    public static void main(String[] args) {
        Marks []student1Marks = {
            new Marks("Social Science", 82),
            new Marks("Science", 73),
            new Marks("Maths", 91)
        };

        Marks []student2Marks = {
            new Marks("Java - Theory", 82),
            new Marks("Data Analytics", 88),
            new Marks("Machine Learning - Theory", 90)
        };

        Student []students = {
            new Student("Krish", student1Marks),
            new Student("Sumer", student2Marks)
        };

        for (Student student : students) {
            student.display();
            System.out.println("\n");
        }
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac MarksMain.java } ; if ($?) { java MarksMain }
Name: Krish
Subject Name: Social Science                    Marks: 82
Subject Name: Science                   Marks: 73
Subject Name: Maths                     Marks: 91
Total Marks: 246
Average Marks: 82.0


Name: Sumer
Subject Name: Java - Theory                     Marks: 82
Subject Name: Data Analytics                    Marks: 88
Subject Name: Machine Learning - Theory                 Marks: 90
Total Marks: 260
Average Marks: 86.66666666666667
```

18.Banking System with Exception and Access Modifiers

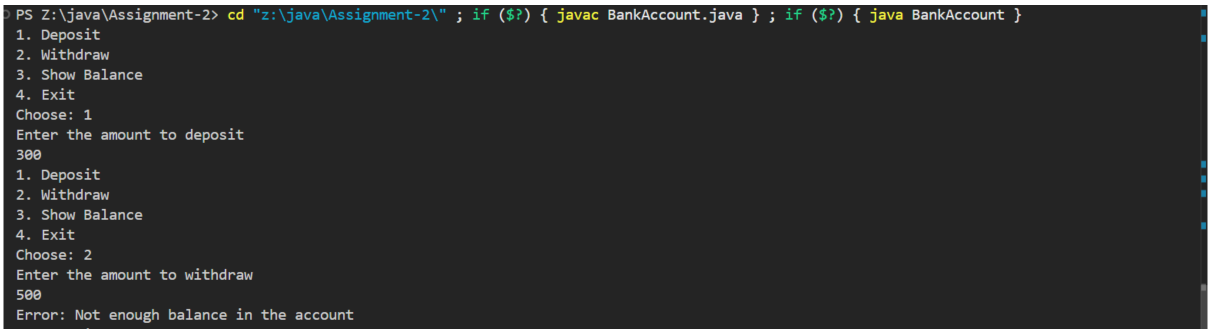
 Create a BankAccount class with private balance, public deposit() and withdraw().

Throw exception if withdrawal amount > balance.

Code:-

```
import java.util.Scanner;

class InvalidDeposit extends Exception {
   public InvalidDeposit(String message) {
      super(message);
   }
}

class InvalidWithdraw extends Exception {
   public InvalidWithdraw(String message) {
      super(message);
   }
}

public class BankAccount {

   private double balance;

   public BankAccount(double balance) {
      this.balance = balance;
   }

   public void depositAmount(double depositAmount) throws InvalidDeposit {
      if (depositAmount < 0) {
         throw new InvalidDeposit("Deposit amount cannot be negative");
      }

      this.balance += depositAmount;
   }

   public void withdrawAmount(double withdrawAmount) throws InvalidWithdraw {
      if (withdrawAmount < 0) {
            throw new InvalidWithdraw("Withdrawn amount cannot be negative");
        }

        if (this.balance < withdrawAmount) {
            throw new InvalidWithdraw("Not enough balance in the account");
        }

        this.balance -= withdrawAmount;
    }

    public void showBalance() {
        System.out.println("Current Balance: " + this.balance);
    }

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        BankAccount bankAccount = new BankAccount(0);

        boolean continueLoop = true;

        while (continueLoop) {
            System.out.print("1. Deposit\n2. Withdraw\n3. Show Balance\n4. Exit\nChoose: ");
            int choice = scanner.nextInt();

            switch (choice) {
                case 1:
                    System.out.println("Enter the amount to deposit");
                    int depositAmount = scanner.nextInt();

                    try {
                        bankAccount.depositAmount(depositAmount);
                    } catch (InvalidDeposit e) {
                        System.out.println("Error: " + e.getMessage());
                    }
                    break;

                case 2:
                    System.out.println("Enter the amount to withdraw");
                    int withdrawAmount = scanner.nextInt();

                    try {
                        bankAccount.withdrawAmount(withdrawAmount);
                    } catch (InvalidWithdraw e) {
                        System.out.println("Error: " + e.getMessage());
                    }
                    break;

                case 3:
                    bankAccount.showBalance();
                    break;
                case 4:
                    continueLoop = false;
                    break;

                default:
                    System.out.println("Invalid Option!");
            }
        }
        scanner.close();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac BankAccount.java } ; if ($?) { java BankAccount }
1. Deposit
2. Withdraw
3. Show Balance
4. Exit
Choose: 1
Enter the amount to deposit
300
1. Deposit
2. Withdraw
3. Show Balance
4. Exit
Choose: 2
Enter the amount to withdraw
500
Error: Not enough balance in the account
```

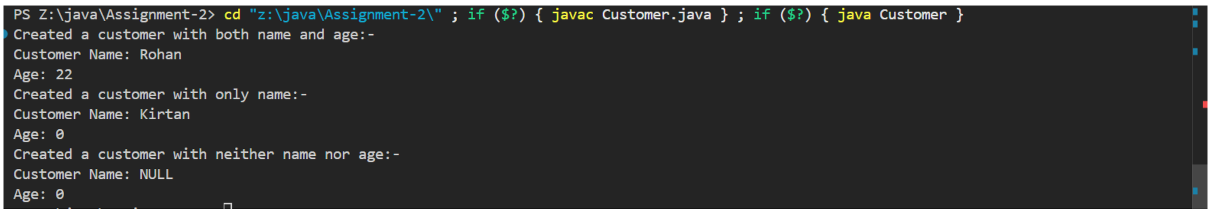
19.Constructor Calling Another Constructor (this())

 Use this() to chain constructors inside a Customer class.

Code:-

```
public class Customer {

    private String name;
    private int age;

    public Customer(String name, int age) {
        this.name = name;
        this.age = age;
    }

    public Customer(String name) {
        this(name, 0);
    }

    public Customer(int age) {
        this("NULL", age);
    }
    public Customer() {
        this("NULL", 0);
    }

    public void display() {
        System.out.println("Customer Name: " + this.name + "\nAge: " + this.age);
    }

    public static void main(String[] args) {
        Customer cust1 = new Customer("Rohan", 22);
        System.out.println("Created a customer with both name and age:-");
        cust1.display();

        Customer cust2 = new Customer("Kirtan");
        System.out.println("Created a customer with only name:-");
        cust2.display();

        Customer cust3 = new Customer();
        System.out.println("Created a customer with neither name nor age:-");
        cust3.display();
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac Customer.java } ; if ($?) { java Customer }
Created a customer with both name and age:-
Customer Name: Rohan
Age: 22
Created a customer with only name:-
Customer Name: Kirtan
Age: 0
Created a customer with neither name nor age:-
Customer Name: NULL
Age: 0
```

20.Library Management with Object Array and Search

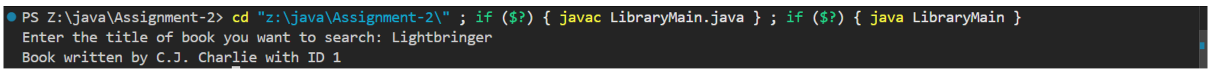
 Book class with ID, title, author. Store multiple books and allow searching by book

title.

Code:-

```
import java.util.Scanner;

class Book {
    private int id;
    private String title;
    private String author;

    public Book(int id, String title, String author) {
        this.id = id;
        this.title = title;
        this.author =  author;
    }
    public String getTitle() {
        return title;
    }

    public String getAuthor() {
        return author;
    }

    public int getId() {
        return id;
    }
}

class Library {

    private String libraryName;
    private Book[] books;

    public Library(String name, Book []books) {
        this.libraryName = name;
        this.books = books;
    }

    public Book searchBookByTitle(String bookTitle) {
        for (Book book : books) {
            if (book.getTitle().equals(bookTitle)) {
                return book;
            }
        }
        return null;
    }

}

public class LibraryMain {
    public static void main(String[] args) {
        Book []books = {
            new Book(1, "Lightbringer", "C.J. Charlie"),
            new Book(2, "Red Rising", "Ritcher Thomson"),
            new Book(3, "Do Sheep Dreams?", "Roger Faraday")
        };

        Library lib = new Library("Dewevilley Library", books);

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the title of book you want to search: ");
        String title = scanner.nextLine();
        scanner.close();

        Book searchedBook = lib.searchBookByTitle(title);
        if (searchedBook != null) {
            System.out.println("Book written by " + searchedBook.getAuthor() + " with ID " +
searchedBook.getId());
        } else {
            System.out.println("We dont have the book in our library!");
        }
    }
}
```

Output:-



```
PS Z:\java\Assignment-2> cd "z:\java\Assignment-2\" ; if ($?) { javac LibraryMain.java } ; if ($?) { java LibraryMain }
Enter the title of book you want to search: Lightbringer
Book written by C.J. Charlie with ID 1
```