EXPERIMENT NO 6

// Problem Statement: Write a program of single inheritance with base class is animal and derived is dog class.

```
class Animal {
    void base() {
        System.out.println("Animal class is base class !!!");
    }
}

class Dog extends Animal {
    void derived() {
        System.out.println("Dog class inherits properties of Animal class !!!");
    }
}

public class SingleInheritance {
    public static void main(String[] args) {
        Dog obj = new Dog();
        obj.base();
        obj.derived();
    }
}
```

/* output

C:\Program Files\Java\jdk-22\bin>javac SingleInheritance.java

C:\Program Files\Java\jdk-22\bin>java SingleInheritance

Animal class is base class !!!

Dog class inherits properties of Animal class !!!

*/

// Problem Statement: Write a program of Multilevel Inheritance with base class is Animal class and Derived class

// name are Dog and BabyDog using method overriding.

```
class Animal {
    void info() {
        System.out.println("Animal class is base class !!!");
    }
}

class Dog extends Animal {
    void info() {
        super.info();
        System.out.println("Dog class inherits properties of Animal class and it is base class for BabyDog class!!!");
    }
}

class BabyDog extends Dog {
    void info() {
        super.info();
        System.out.println("BabyDog class inherits properties of Dog class !!!");
    }
}

public class MultilevelInheritance {
    public static void main(String[] args) {
        BabyDog obj = new BabyDog();
```

```
        obj.info();
    }
}
/* output

C:\Program Files\Java\jdk-22\bin>javac MultilevelInheritance.java
C:\Program Files\Java\jdk-22\bin>java MultilevelInheritance
Animal class is base class !!!
Dog class inherits properties of Animal class and it is base class for BabyDog class!!!
BabyDog class inherits properties of Dog class !!!
*/
```

// Problem Statement: Write a program of hierarchical inheritance with base class is animal class and derived classes are Dog class and Cat class.

```
class Animal {
    void m1() {
        System.out.println("Animal class is base class for Dog and Cat class.");
    }
}

class Dog extends Animal {
    void m2() {
        System.out.println("Dog class is derived class of Animal Class.");
    }
}

class Cat extends Animal {
    void m3() {
        System.out.println("Cat class is derived class of Animal Class.");
    }
}

public class HierarchicalInheritance {
    public static void main(String[] args) {
        Dog d = new Dog();
        Cat c = new Cat();
        d.m2();
        d.m1();
        c.m3();
        c.m1();
```

```
    }
}

/* output

C:\Program Files\Java\jdk-22\bin>javac HierarchicalInheritance.java
C:\Program Files\Java\jdk-22\bin>java HierarchicalInheritance
Dog class is derived class of Animal Class.
Animal class is base class for Dog and Cat class.
Cat class is derived class of Animal Class.
Animal class is base class for Dog and Cat class.
*/
```

EXPERIMENT NO 7

// Problem Statement: Create a Shape class with different methods to calculate areas of different shapes (triangle, circle, square, rectangle)

```
class Shape {
    // Calculate area of triangle
    double area(double base, double height) {
        double areatri = (base * height) / 2;
        System.out.println("Area of triangle: " + areatri);
        return areatri;
    }

    // Calculate area of circle
    double area(double r) {
        double areacir = 3.14 * r * r;
        System.out.println("Area of circle: " + areacir);
        return areacir;
    }

    // Calculate area of square
    double area() {
        double areasqr = 4;
        System.out.println("Area of square: " + areasqr);
        return areasqr;
    }

    // Calculate area of rectangle
    double area(int l, int w) {
```

```
        double arearect = l * w;
        System.out.println("Area of rectangle: " + arearect);
        return arearect;
    }

    public static void main(String[] args) {
        Shape s = new Shape();
        s.area(5.6);     // circle
        s.area();        // square
        s.area(6);       // circle
        s.area(4, 5);    // rectangle
    }
}
/* output
C:\Program Files\Java\jdk-22\bin>javac Shape.java
C:\Program Files\Java\jdk-22\bin>java Shape
Area of circle: 98.4704
Area of square: 4.0
Area of circle: 113.04
Area of rectangle: 20.0
*/
```

// Problem Statement: Write a Java program to create a base class Bank with method with interest_rate().

// Create two subclasses SBI and ICICI. Override the interest_rate() method to find out interest rate.

```
class Bank {
    int interestRate() {
        return 0;
    }
}

class SBI extends Bank {
    int interestRate() {
        return 7;
    }
}

class ICICI extends Bank {
    int interestRate() {
        return 8;
    }
}

class Test {
    public static void main(String[] args) {
        Bank b = new Bank();
        SBI s = new SBI();
        ICICI i = new ICICI();

        System.out.println("Bank rate of interest is: " + b.interestRate());
```

```
        System.out.println("SBI rate of interest is: " + s.interestRate());
        System.out.println("ICICI rate of interest is: " + i.interestRate());
    }
}



/* output
C:\Program Files\Java\jdk-22\bin>javac Test.java
C:\Program Files\Java\jdk-22\bin>java Test
Bank rate of interest is: 0
SBI rate of interest is: 7
ICICI rate of interest is: 8
*/
```

/* Problem Statement: Write a program to create user exception (user defined exception) to accept age from user and throw an exception if the age is negative*/

```
import java.util.Scanner;

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

public class Demo1 {
    static void checkAge() {
        int age;
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the number you want to check: ");
        age = s.nextInt();

        if(age < 0) {
            throw new ArithmeticException("Age cannot be Negative!");
        } else {
            System.out.println("Welcome!");
        }
    }

    public static void main(String[] args) {
        checkAge();
    }
}
/* output
```

C:\Program Files\Java\jdk-22\bin>javac Demo1.java

C:\Program Files\Java\jdk-22\bin>java Demo1

Enter the number you want to check:

-5

java.lang.ArithmeticException: Age cannot be Negative!

C:\Program Files\Java\jdk-22\bin>java Demo1

Enter the number you want to check:

25

Welcome!

*/

// Problem Statement: Write a program to create user exception (user defined exception) to accept no. from user and throw an exception if the number is not even

```
import java.util.Scanner;


public class Main {
   static void checkAge() {
      int n;
      Scanner scanner = new Scanner(System.in);
      System.out.println("Enter the number you want to check: ");
      n = scanner.nextInt();


      if(n % 2 != 0) {
         throw new ArithmeticException("Even no!");
      } else {
         System.out.println("Odd no!");
      }
   }


   public static void main(String[] args) {
      checkAge();
   }
}
```

```
/* output
C:\Program Files\Java\jdk-22\bin>javac Main.java
```

C:\Program Files\Java\jdk-22\bin>java Main

Enter the number you want to check:

7

java.lang.ArithmeticException: Even no!

C:\Program Files\Java\jdk-22\bin>java Main

Enter the number you want to check:

8

Odd no!

*/

EXPERIMENT NO 8

// Problem Statement: Write a program to implement inheritance with Student class and Sports interface

// to calculate percentage and display student details.

```
import java.util.Scanner;


class Student {
   int rollno;
   String name;


   Student(int r, String n) {
      rollno = r;
      name = n;
   }
}
interface Sports {
   final int sport_wt = 5;
   void show();
}
class Result extends Student implements Sports {
   int mark1, mark2;
   double per;


   Result(int r, String n, int m1, int m2) {
      super(r, n);
      mark1 = m1;
      mark2 = m2;
   }
```

```
    void calculatePercentage() {
        per = ((mark1 + mark2 + sport_wt) * 100) / 200;
    }

    public void show() {
        System.out.println("Name: " + name);
        System.out.println("Roll No: " + rollno);
        System.out.println("Percentage: " + per);
        System.out.println("Sports weightage: " + sport_wt);
    }
}

public class Main {
    public static void main(String[] args) {
        Result r = new Result(1, "John", 85, 90);
        r.calculatePercentage();
        r.show();
    }
}/* output
C:\Program Files\Java\jdk-22\bin>javac Main.java
C:\Program Files\Java\jdk-22\bin>java Main
Name: John
Roll No: 1
Percentage: 90.0
Sports weightage: 5
*/
```

// Problem Statement: Write a program to implement inheritance with Student class and Employee interface

// to calculate salary with allowances and display employee details.

```
import java.util.Scanner;
class Student {
    protected int rollno;
    protected String name;
       void input() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the Name: ");
        name = sc.nextLine();
        System.out.println("Enter the Roll no: ");
        rollno = sc.nextInt();
    }
        void output() {
        System.out.println("Name: " + name);
        System.out.println("Roll No: " + rollno);
    }
}
interface Employee {
    double B_SALARY = 20000.0;  // Base salary
    double HRA = 10000.0;       // House Rent Allowance
    double DA = 8000.0;         // Dearness Allowance
        void show();
}
class Manager extends Student implements Employee {
    int id = 101;
    double totalSalary;
        void calculateSalary() {
```

```
        totalSalary = B_SALARY + HRA + DA;
    }
        public void show() {
        System.out.println("Manager ID: " + id);
        System.out.println("Total Salary: " + totalSalary);
    }
}
public class Main {
    public static void main(String[] args) {
        Manager m = new Manager();
        m.input();
        m.output();
        m.calculateSalary();
        m.show();
    }
}
/* output
C:\Program Files\Java\jdk-22\bin>javac Main.java
C:\Program Files\Java\jdk-22\bin>java Main
Enter the Name:
John Doe
Enter the Roll no:
101
Name: John Doe
Roll No: 101
Manager ID: 101
Total Salary: 38000.0
*/
```

EXPERIMENT NO 9

// Problem Statement: Write a program to create own exception (user defined exception) to accept no. from user and throw an exception if the number is not even.

```
import java.util.*;


class NotEvenException extends Exception {
   NotEvenException() {
      System.out.println("Number is not Even!");
   }
}


class CheckEvenNumber {
   public static void main(String[] args) {
      int number;
      Scanner sc = new Scanner(System.in);
      try {
         System.out.println("Enter any Number:");
         number = sc.nextInt();


         if(number % 2 != 0) {
            throw new NotEvenException();
         } else {
            System.out.println("Number is Even!");
         }
      } catch(Exception e) {
         System.out.println(e);
      }
   }
```

```
}
/* output
C:\Program Files\Java\jdk-22\bin>javac CheckEvenNumber.java
C:\Program Files\Java\jdk-22\bin>java CheckEvenNumber
Enter any Number:
7
Number is not Even!
java.NotEvenException

C:\Program Files\Java\jdk-22\bin>java CheckEvenNumber
Enter any Number:
8
Number is Even!
*/
```

// Problem Statement: Write a program to create own exception (user defined exception) to accept no. from user and throw an exception if the number is not prime.

```
import java.util.*;

class NotPrimeException extends Exception {
    NotPrimeException() {
        System.out.println("Number is not Prime");
    }
}

class CheckPrimeNumber {
    public static void main(String[] args) {
        int number;
        Scanner sc = new Scanner(System.in);
        try {
            System.out.println("Enter any Number:");
            number = sc.nextInt();
            boolean flag = true;

            for(int i = 2; i <= number/2; i++) {
                if(number % i == 0) {
                    flag = false;
                    break;
                }
            }
            if(!flag) {
                throw new NotPrimeException();
            } else {
                System.out.println("Number is Prime!");
```

```
            }
        } catch(Exception e) {
            System.out.println(e);
        }
    }
}
/* output

C:\Program Files\Java\jdk-22\bin>javac CheckPrimeNumber.java
C:\Program Files\Java\jdk-22\bin>java CheckPrimeNumber
Enter any Number:
4
Number is not Prime
java.NotPrimeException

C:\Program Files\Java\jdk-22\bin>java CheckPrimeNumber
Enter any Number:
7
Number is Prime!

*/
```

// Problem Statement: Write a program to create own exception (user defined exception) to accept age from user and throw an exception if the age is negative

```
import java.util.*;


class NegativeAgeException extends Exception {
    NegativeAgeException() {
        System.out.println("Enter Valid age:");
    }
}


class CheckAge {
    public static void main(String[] args) {
        int age;
        Scanner sc = new Scanner(System.in);
        try {
            System.out.println("Enter your age:");
            age = sc.nextInt();


            if(age < 0) {
                throw new NegativeAgeException();
            } else {
                System.out.println("Your age is " + age);
            }
        } catch(Exception e) {
            System.out.println(e);
        }
    }
}
/* output
```

C:\Program Files\Java\jdk-22\bin>javac CheckAge.java

C:\Program Files\Java\jdk-22\bin>java CheckAge

Enter your age:

-5

Enter Valid age:

java.NegativeAgeException

C:\Program Files\Java\jdk-22\bin>java CheckAge

Enter your age:

25

Your age is 25

*/

// Problem Statement: Write a program to create own exception (user defined exception) to accept String from user and throw an exception if the string is not starting with 'A'.

```
import java.util.*;

class notStartWithAException extends Exception {
   notStartWithAException() {
      System.out.println("String is not starting with 'A'");
   }
}

public class Exception4 {
   public static void main(String[] args) {
      String str;
      Scanner obj = new Scanner(System.in);
      try {
         System.out.println("Enter any String:");
         str = obj.nextLine();

         if(!str.startsWith("A")) {
            throw new notStartWithAException();
         } else {
            System.out.println("String is starting with 'A'");
         }
      } catch(Exception e) {
         System.out.println(e);
      }
   }
}
```

```
/* output

C:\Program Files\Java\jdk-22\bin>javac Exception4.java
C:\Program Files\Java\jdk-22\bin>java Exception4
Enter any String:
Bob
String is not starting with 'A'
java.notStartWithAException

C:\Program Files\Java\jdk-22\bin>java Exception4
Enter any String:
Alex
String is starting with 'A'
*/
```

// Problem Statement: Write a program to create own exception (user defined exception) to accept password from user and throw an "AuthenticationFailure" exception if the password is incorrect.

```
import java.util.*;

class AuthenticationFailureException extends Exception {
    AuthenticationFailureException() {
        System.out.println("Authentication Failure: Incorrect Password!");
    }
}

class CheckPassword {
    public static void main(String[] args) {
        int password;
        Scanner sc = new Scanner(System.in);
        try {
            System.out.println("Enter Password:");
            password = sc.nextInt();

            if(password != 1066) {
                throw new AuthenticationFailureException();
            } else {
                System.out.println("Authentication Success!");
            }
        } catch(Exception e) {
            System.out.println(e);
        }
    }
```

```
}

/* output

C:\Program Files\Java\jdk-22\bin>javac CheckPassword.java
C:\Program Files\Java\jdk-22\bin>java CheckPassword
Enter Password:
1234
Authentication Failure: Incorrect Password!
java.AuthenticationFailureException

C:\Program Files\Java\jdk-22\bin>java CheckPassword
Enter Password:
1066
Authentication Success!
*/
```

EXPERIMENT NO 10

//Write a java program that calculate area of circle using creating and accessing package

a. Creation of simple package

```
package create;

public class Circle {
    public int radius;

    public double calculateArea() {
        return 3.14 * radius * radius;
    }
}
```

a. Accessing a package

```
package access;

import create.*;

public class AreaOfCircle {
    public static void main(String[] args) {
        Circle c = new Circle();
        c.radius = 5;
        double area = c.calculateArea();
        System.out.println("Area of the circle: " + area);
    }
}
```

```
/* output

C:\Program Files\Java\jdk-22\bin>javac -d . Circle.java

C:\Program Files\Java\jdk-22\bin>javac -d . AreaOfCircle.java

C:\Program Files\Java\jdk-22\bin>java access.AreaOfCircle

Area of the circle: 78.5

*/
```