Nepathya College
Tilottama-5, Rupandehi

Object Oriented Programming in Java
Lab 4

Objective: To learn concepts of Inheritance, techniques to use it, concept of overriding, use of keyword super, abstract class and method.

Descriptions:

- **Refer theory from the slides.**

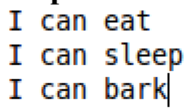
Program

Note: The program should be well formatted i.e. proper use of indentation, comment, description of program and functions etc.

1. Complete the following program in java, that demonstrate the feature of simple inheritance.

```
class Animal{
        void eat(){
                System.out.println("I can eat");
        }
        void sleep(){
                System.out.println("I can sleep");
        }
}
class Dog {
}
```

Output

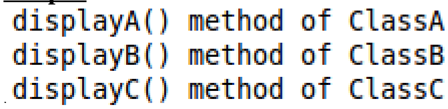


```
I can eat
I can sleep
I can bark
```

2. Complete the program in java that demonstrate the concept of multilevel inheritance.

```
class ClassA {
        void displayA(){
    System.out.println("displayA() method of ClassA");
  }
}
class ClassB
}

class ClassC
}
public class multiinheritance {
        public static void main(String[] args) {
                c.displayC();
        }
}
```

Output



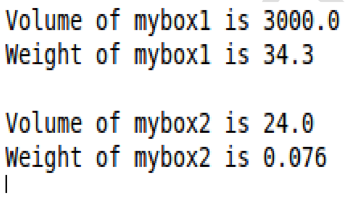
```
displayA() method of ClassA
displayB() method of ClassB
displayC() method of ClassC
```

3. Write a program in java that demonstrate the concept of Hierarchical inheritance. Use similar class of question 2.

4. Complete the following program in java that demonstrate the feature of inheritance.

```
class Box {
        double width;
        double height;
        double depth;

        double volume() {
                return width * height * depth;
        }
}
class BoxWeight extends Box {
        double weight;
        BoxWeight(double w, double h, double d, double m) {
        }
}
public class boxdemoweight {
        public static void main(String[] args) {

                BoxWeight mybox2 = new BoxWeight(2, 3, 4, 0.076);
                double vol;
                vol = mybox1.volume();
                System.out.println("Volume of mybox1 is " + vol);

                vol = mybox2.volume();
                System.out.println("Volume of mybox2 is " + vol);
                System.out.println("Weight of mybox2 is " + mybox2.weight);
        }

}
```

Output



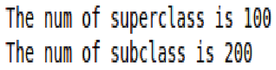
```
Volume of mybox1 is 3000.0
Weight of mybox1 is 34.3

Volume of mybox2 is 24.0
Weight of mybox2 is 0.076
```

5. Create a class student with instance variables roll_no and two methods to read and display the roll_no. Then create another class Test that inherits class student, consisting of its own instance variables to hold the marks of two subjects and also methods to read and display the marks. Finally create another class Result which inherits class Test. It also has its own instance variable total to hold the total of two marks scored by the student. Similarly, it has methods to calculate and display the total. Create some instance of above classes and demonstrate inheritance.

6. Complete the program in java to access the parent class data item from child class by using super keyword.

```
class superclass{
        int num = 100;
}
class subclass extends superclass{
        int num = 200;
}
public class superkey {
        public static void main(String[] args) {

        }
}
```

Output

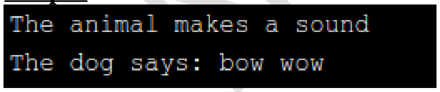


```
The num of superclass is 100
The num of subclass is 200
```

7. Complete the program in java to show the use of super keyword to invoke parent class method.

```
class Animal {
        public void animalSound() {
                System.out.println("The animal makes a sound");
        }
}
class Dog extends Animal {
        public void animalSound() {

        }
}

public class superkey {
        public static void main(String[] args) {

                myDog.animalSound();
  }
}
```

Output

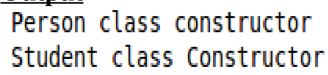


```
The animal makes a sound
The dog says: bow wow
```

8. Complete the program in java to show the use of super keyword to invoke constructor of parent class.

```
class person{
        person(){
                System.out.println("Person class constructor");
        }
}
class student extends person{
        student(){

        }
}
public class superkey {
        public static void main(String[] args) {

        }
}
```

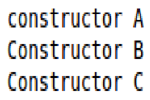
<u>Output</u>



```
Person class constructor
Student class Constructor
```

9. Write a program in java to demonstrate the order of constructor in multilevel inheritance. To do so, create a class A, than a class B that is inherited from class A, again create class C that is inherited from class B. The output of the program is given below

<u>Output</u>



```
constructor A
Constructor B
Constructor C
```

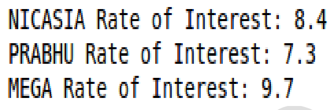
10. Run the following program in Java, that demonstrate the concepts of method overriding and run time-polymorphism. NOTE: read the comment properly, it may confuse you.

```
// Base Class
class Parent {
        void show()
        {
                System.out.println("Parent's show()");
        }
}

// Inherited class
class Child extends Parent {
        // This method overrides show() of Parent
        //Override
        void show()
        {
                System.out.println("Child's show()");
        }
}
public class override {
        public static void main(String[] args)
        {
                // If a Parent type reference refers to a Parent object, then Parent's  show is called
                Parent obj1 = new Parent();
                obj1.show();

// If a Parent type reference refers  to a Child object Child's show()  is called. This is called RUN TIME POLYMORPHISM.
                Parent obj2 = new Child();
                obj2.show();
        }
}
```

11. Complete the program in java that demonstrate the concepts of method overriding and run time polymorphism.

```
class Bank{
        float getRateOfInterest(){return 0;}
}
class NICASIA extends Bank{
        float getRateOfInterest(){return 8.4f;}

public class constructor1{
        public static void main(String args[]){
                Bank b;
                b=new PRABHU();
                System.out.println("PRABHU Rate of Interest: "+b.getRateOfInterest());

        }
}
```

Output



```
NICASIA Rate of Interest: 8.4
PRABHU Rate of Interest: 7.3
MEGA Rate of Interest: 9.7
```

12. Complete the program to demonstrate the concept of run time polymorphism using super keyword.

```
class Company {

        public void address() {
                System.out.println("This is Address of my Company...");
        }
}
 class eBay extends Company {

        public void address() {
                super.address(); // invokes the super class method
                System.out.println("This is eBay's Address...");
        }
}
public class runtimepolymorphism {

        public static void main(String args[]) {
                Company a = new Company(); // Company reference and object
                Company b = new eBay(); // Company reference but eBay object

                a.address();// runs the method in Company class
                b.address();// Runs the method in eBay class
        }
}
```