1. Write a Java Program to implement 1/O Decorator for converting uppercase letters to lower case letters.

```
import java.io.*;

public class LowercaseDecorator extends FilterReader {
   public LowercaseDecorator(Reader in) {
      super(in);
   }

   @Override
   public int read() throws IOException {
      int c = super.read();
      return (c == -1) ? c : Character.toLowerCase((char) c);
   }

   @Override
   public int read(char[] cbuf, int off, int len) throws IOException {
      int numCharsRead = super.read(cbuf, off, len);
      for (int i = off; i < off + numCharsRead; i++) {
         cbuf[i] = Character.toLowerCase(cbuf[i]);
      }
      return numCharsRead;
   }

   public static void main(String[] args) throws IOException {
      StringReader sr = new StringReader("HELLO WORLD");
      LowercaseDecorator lsd = new LowercaseDecorator(sr);
      int c;
      while ((c = lsd.read()) != -1) {
         System.out.print((char) c);
      }
   }
}
```

OUTPUT:-

```
ct\bin' 'LowercaseDecorator'
hello world
PS C:\Users\apple\Desktop\mohite html>
```

2. Write a Java Program to implement Factory method for Pizza Store with createPizza, orederPizza, prepare. Bake, cut, box. Use this to create variety of pizza's like NyStyleCheesePizza

```
abstract class Pizza {
   public abstract void prepare();
   public abstract void bake();
   public abstract void cut();
   public abstract void box();
}

class NYStyleCheesePizza extends Pizza {
   public void prepare() { System.out.println("Preparing NY Style Cheese Pizza"); }
   public void bake() { System.out.println("Baking NY Style Cheese Pizza"); }
   public void cut() { System.out.println("Cutting NY Style Cheese Pizza"); }
   public void box() { System.out.println("Boxing NY Style Cheese Pizza"); }
}

abstract class PizzaStore {
   public Pizza orderPizza(String type) {
      Pizza pizza = createPizza(type);
      pizza.prepare();
      pizza.bake();
      pizza.cut();
      pizza.box();
      return pizza;
   }

   protected abstract Pizza createPizza(String type);
}

class NYPizzaStore extends PizzaStore {
   @Override
   protected Pizza createPizza(String type) {
      if (type.equals("cheese")) {
         return new NYStyleCheesePizza();
      }
      return null;
   }


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

```
        PizzaStore store = new NYPizzaStore();
        store.orderPizza("cheese");
    }


}
```

OUTPUT:-

```
p' 'C:\Users\apple\AppData\Roaming\Code\Us
ct\bin' 'ex'
Preparing NY Style Cheese Pizza
Baking NY Style Cheese Pizza
Cutting NY Style Cheese Pizza
Boxing NY Style Cheese Pizza
```

3.Write a Java Program to implement Singleton pattern for multithreading.

```
public class Singleton {
   private static Singleton instance;

   private Singleton() { }

   public static synchronized Singleton getInstance() {
      if (instance == null) {
         instance = new Singleton();
      }
      return instance;
   }

   public static void main(String[] args) {
      Runnable task = () -> {
         Singleton singleton = Singleton.getInstance();
         System.out.println(singleton);
      };

      Thread t1 = new Thread(task);
      Thread t2 = new Thread(task);
      t1.start();
      t2.start();
   }
}
```

4.Write a Java Program to implement Adapter pattern for Enumeration Iterator

```
import java.util.*;

class EnumerationAdapter implements Iterator<Object> {
   private Enumeration<?> enumeration;

   public EnumerationAdapter(Enumeration<?> enumeration) {
      this.enumeration = enumeration;
   }

   @Override
   public boolean hasNext() {
      return enumeration.hasMoreElements();
   }

   @Override
   public Object next() {
      return enumeration.nextElement();
   }
}

public class AdapterPatternDemo {
   public static void main(String[] args) {
      Vector<String> vector = new Vector<>();
      vector.add("One");
      vector.add("Two");
      vector.add("Three");

      Enumeration<?> enumeration = vector.elements();
      Iterator<?> iterator = new EnumerationAdapter(enumeration);

      while (iterator.hasNext()) {
         System.out.println(iterator.next());
      }
   }
}
```

OUTPUT:-

```
ct\bin' 'AdapterPatternDemo'
One
Two
Three
PS C:\Users\apple\Desktop\mohite html>
```

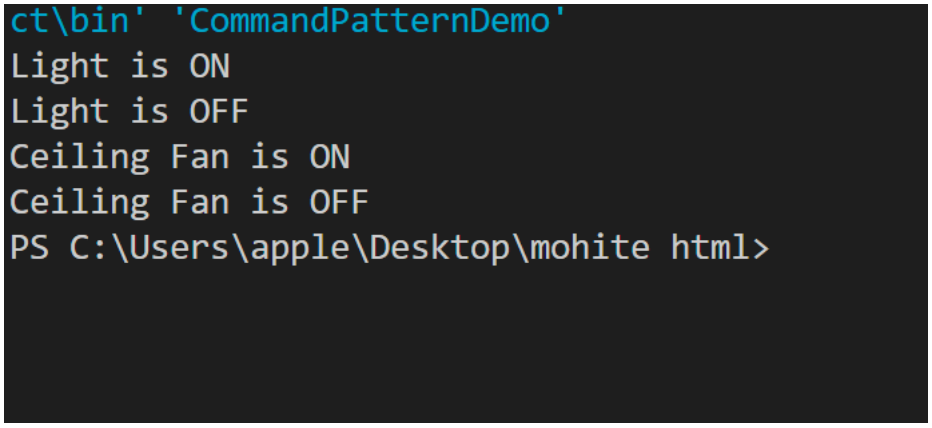
5.Write a Java Program to implement command pattern to test Remote Control(to ON and OFF lightV ON and OFF ceiling Fan)

```
interface Command {
   void execute();
}

class Light {
   public void on() { System.out.println("Light is ON"); }
   public void off() { System.out.println("Light is OFF"); }
}

class CeilingFan {
   public void on() { System.out.println("Ceiling Fan is ON"); }
   public void off() { System.out.println("Ceiling Fan is OFF"); }
}

class LightOnCommand implements Command {
   private Light light;

   public LightOnCommand(Light light) {
      this.light = light;
   }

   @Override
   public void execute() {
      light.on();
   }
}

class LightOffCommand implements Command {
   private Light light;

   public LightOffCommand(Light light) {
      this.light = light;
   }

   @Override
   public void execute() {
      light.off();
   }
}

class CeilingFanOnCommand implements Command {
   private CeilingFan ceilingFan;
```

```
    public CeilingFanOnCommand(CeilingFan ceilingFan) {
        this.ceilingFan = ceilingFan;
    }

    @Override
    public void execute() {
        ceilingFan.on();
    }
}

class CeilingFanOffCommand implements Command {
    private CeilingFan ceilingFan;

    public CeilingFanOffCommand(CeilingFan ceilingFan) {
        this.ceilingFan = ceilingFan;
    }

    @Override
    public void execute() {
        ceilingFan.off();
    }
}

class RemoteControl {
    private Command command;

    public void setCommand(Command command) {
        this.command = command;
    }

    public void pressButton() {
        command.execute();
    }
}

public class CommandPatternDemo {
    public static void main(String[] args) {
        Light light = new Light();
        CeilingFan ceilingFan = new CeilingFan();

        Command lightOn = new LightOnCommand(light);
        Command lightOff = new LightOffCommand(light);
        Command ceilingFanOn = new CeilingFanOnCommand(ceilingFan);
        Command ceilingFanOff = new CeilingFanOffCommand(ceilingFan);

        RemoteControl remote = new RemoteControl();
```

```
        remote.setCommand(lightOn);
        remote.pressButton();

        remote.setCommand(lightOff);
        remote.pressButton();

        remote.setCommand(ceilingFanOn);
        remote.pressButton();

        remote.setCommand(ceilingFanOff);
        remote.pressButton();
    }
}
```

OUTPUT:-



6. Write a Java Program to implement Strategy Pattern for Duck Behavior.
Create instance variable that holds current state of Duck from there, we just need to handle all Flying Behaviors and Quack Behaviour

```
public
interface FlyBehavior {
   void fly();
}

interface QuackBehavior {
   void quack();
}

class FlyWithWings implements FlyBehavior {
   public void fly() { System.out.println("I'm flying with wings!"); }
}

class FlyNoWay implements FlyBehavior {
   public void fly() { System.out.println("I can't fly."); }
}

class Quack implements QuackBehavior {
   public void quack() { System.out.println("Quack!"); }
}

class MuteQuack implements QuackBehavior {
   public void quack() { System.out.println("<< Silence >>"); }
}

abstract class Duck {
   protected FlyBehavior flyBehavior;
   protected QuackBehavior quackBehavior;

   public Duck(FlyBehavior fb, QuackBehavior qb) {
      flyBehavior = fb;
      quackBehavior = qb;
   }

   public void performFly() {
      flyBehavior.fly();
   }

   public void performQuack() {
      quackBehavior.quack();
   }

   public void swim() {
```

```
        System.out.println("All ducks float!");
    }

    public abstract void display();
}

class MallardDuck extends Duck {
    public MallardDuck() {
        super(new FlyWithWings(), new Quack());
    }

    public void display() {
        System.out.println("I'm a real Mallard duck!");
    }
}

class ModelDuck extends Duck {
    public ModelDuck() {
        super(new FlyNoWay(), new MuteQuack());
    }

    public void display() {
        System.out.println("I'm a model duck.");


    }
}

public class StrategyPatternDemo {
    public static void main(String[] args) {
        Duck mallard = new MallardDuck();
        mallard.display();
        mallard.performFly();
        mallard.performQuack();


        Duck model = new ModelDuck();
        model.display();
        model.performFly();
        model.performQuack();
    }
}
```

OUTPUT:-

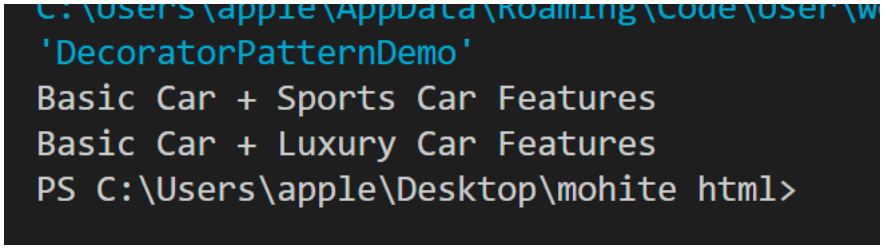
```
ct\bin' 'StrategyPatternDemo1'
I'm a real Mallard duck!
I'm flying with wings!
Quack!
I'm a model duck.
I can't fly.
<< Silence >>
PS C:\Users\apple\Desktop\mohite html>
```

7. Write a Java Program to implement Decorator Pattern for interface Car to define the assemble() method and then decorate it to Sports car and Luxury Car

```
interface Car {
   String assemble();
}

class BasicCar implements Car {
   public String assemble() {
      return "Basic Car";
   }
}

abstract class CarDecorator implements Car {
   protected Car car;

   public CarDecorator(Car car) {
      this.car = car;
   }

   public String assemble() {
      return car.assemble();
   }
}

class SportsCar extends CarDecorator {
   public SportsCar(Car car) {
      super(car);
   }

   public String assemble() {
      return super.assemble() + " + Sports Car Features";
   }
}

class LuxuryCar extends CarDecorator {
   public LuxuryCar(Car car) {
      super(car);
   }

   public String assemble() {
      return super.assemble() + " + Luxury Car Features";
   }
}

public class DecoratorPatternDemo {
```

```
    public static void main(String[] args) {
        Car sportsCar = new SportsCar(new BasicCar());
        System.out.println(sportsCar.assemble());

        Car luxuryCar = new LuxuryCar(new BasicCar());
        System.out.println(luxuryCar.assemble());
    }
}
```

OUTPUT:-



8. Write a Java Program to implement Abstract Factory Pattern for Shape interface

```
interface Shape {
   void draw();
}

class Circle implements Shape {
   @Override
   public void draw() {
      System.out.println("Drawing Circle");
   }
}

class Rectangle implements Shape {
   @Override
   public void draw() {
      System.out.println("Drawing Rectangle");
   }
}

class Square implements Shape {
   @Override
   public void draw() {
      System.out.println("Drawing Square");
   }
}

interface ShapeFactory {
   Shape createShape();
}

class CircleFactory implements ShapeFactory {
   @Override
   public Shape createShape() {
      return new Circle();
   }
}

class RectangleFactory implements ShapeFactory {
   @Override
   public Shape createShape() {
      return new Rectangle();
   }
}
```

```
class SquareFactory implements ShapeFactory {
   @Override
   public Shape createShape() {
      return new Square();
   }
}

public class AbstractFactoryPatternDemo {
   public static void main(String[] args) {
      ShapeFactory circleFactory = new CircleFactory();
      Shape circle = circleFactory.createShape();
      circle.draw();

      ShapeFactory rectangleFactory = new RectangleFactory();
      Shape rectangle = rectangleFactory.createShape();
      rectangle.draw();

      ShapeFactory squareFactory = new SquareFactory();
      Shape square = squareFactory.createShape();
      square.draw();
   }
}
```