Programming in Java LAB

PAPER CODE	**:**	***CIC-258***
Faculty Name	:	Mr. Anupam Kumar
Name	:	Amit Singhal
Enrollment No.	:	11614802722
Branch	:	Computer Science & Engg.
Semester | Group	:	4C6

MAHARAJA AGRASEN INSTITUTE OF TECHNOLOGY

PSP Area, Plot No. 1, Sector-22, Rohini, Delhi-110086

LAB Assessment Sheet

S.NO.	Experiment Name	M	A	R	K	S	Total Marks	Date of Perf.	Date of Check.	Signature
		R1	R2	R3	R4	R5				
	LAB_01									
1.	Welcome_Message							01-02-24	08-02-24	
2.	ASCII Code of character							01-02-24	08-02-24	
3.	Sum of 2 Integers							01-02-24	08-02-24	
4.	Swap (using Bitwise)							01-02-24	08-02-24	
	LAB_02									
5.	Character_Order							08-02-24	15-02-24	
6.	Colour_Code							08-02-24	15-02-24	
7.	Even_Numbers							08-02-24	15-02-24	
8.	Floyds_Format							08-02-24	15-02-24	
9.	Palindrome_Check							08-02-24	15-02-24	
	LAB_03									
10.	ASCII to Char							15-02-24	22-02-24	
11.	Reverse 2D Array							15-02-24	22-02-24	
12.	Stack using LL							15-02-24	22-02-24	
13.	Queue using LL							15-02-24	22-02-24	
14.	Tokenizer							15-02-24	22-02-24	
15.	Area_Calculator							15-02-24	22-02-24	
	LAB_04									
16.	Box_Volume							22-02-24	29-02-24	
17.	'This' use							22-02-24	29-02-24	
18.	Instance_Counter							22-02-24	29-02-24	
19.	Cube_Calculator							22-02-24	29-02-24	
	LAB_05									
20.	Method_Overriding							22-02-24	29-02-24	
21.	Simple_Inheritance							22-02-24	29-02-24	
22.	MultiLevel_Inheritance							22-02-24	29-02-24	
23.	'super' Keyword							22-02-24	29-02-24	

S.No.	Experiment Name	M	A	R	K	S	Total Marks	Date of Perf.	Date of Check.	Signature
		R1	R2	R3	R4	R5				
24.	Dynamic Polymorphism & Interface Overriding							22-02-24	29-02-24	
	LAB_06									
25.	Abstract Class							29-02-24	07-03-24	
26.	Interface							29-02-24	07-03-24	
27.	Packages							29-02-24	07-03-24	
	LAB_07									
28.	Exception Handling							07-03-24	14-03-24	
29.	Custom Exception							07-03-24	14-03-24	
30.	Applet (Hello World)							07-03-24	14-03-24	
31.	Applet (Analog Clock)							07-03-24	14-03-24	
	LAB_08									
32.	Multi-Threading							14-03-24	21-03-24	
33.	Threading #1							14-03-24	21-03-24	
34.	Threading #2							14-03-24	21-03-24	
35.	File Handling							14-03-24	21-03-24	
	LAB_09									
36.	Slang_Censorer							18-04-24	25-04-24	

MAHARAJA AGRASEN INSTITUTE OF TECHNOLOGY

Computer Science & Engineering Department

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Lab Exercise - 1

Program - 1

```
//Program to accept a String as a
command-line argument and print a Welcome
message:

package LAB_01;

public class prg_01_welcome {
    public static void main(String[]
args) {
        if (args.length > 0) {
            String name = args[0];
            System.out.println("Welcome "
+ name);
        } else {
            System.out.println("Please
provide your name as a command-line
argument.");
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java> cd LAB_01
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_01> javac prg_01_Welcome_Message.java
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_01> java .\prg_01_Welcome_Message.java AmitSinghal
Welcome AmitSinghal
```

Program - 2

```java
//Program to find ASCII code of a character:

package LAB_01;

import java.util.Scanner;

public class prg_02_ascii {
    public static void main(String[] args) {
        Scanner scanner = new
Scanner(System.in);

        System.out.print("Enter a character:
");
        char inputChar =
scanner.next().charAt(0);

        int asciiValue = (int) inputChar;
        System.out.println("ASCII code of " +
inputChar + " is: " + asciiValue);

        scanner.close();
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_01> java .\prg_02_ASCII_code.java
Enter a character: R
ASCII code of R is: 82
```

Program - 3

```
//Program to accept two integers as inputs and
print their sum:

package LAB_01;

import java.util.Scanner;

public class prg_03_sum {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first integer:
");
        int num1 = scanner.nextInt ();

        System.out.print("Enter the second
integer: ");
        int num2 = scanner.nextInt();

        int sum = num1 + num2;
        System.out.println("Sum of " + num1 + "
and " + num2 + " is: " + sum);

        scanner.close();
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_01> java .\prg_03_sum.java
Enter the first integer: 116
Enter the second integer: 712
Sum of 116 and 712 is: 828
```

Program - 4

```
//Swapping two numbers using bitwise
operator:

package LAB_01;

public class prg_04_swap {
    public static void main(String[] args) {

        int a = 5;
        int b = 10;

        System.out.println("Before swapping:
a = " + a + ", b = " + b);

        // Using bitwise XOR to swap values
without using a temporary variable
        a = a ^ b;
        b = a ^ b;
        a = a ^ b;

        System.out.println("After swapping: a
= " + a + ", b = " + b);
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_01> java .\prg_04_swap.java
Before swapping: a = 5, b = 10
After swapping: a = 10, b = 5
```

Lab Exercise - 2

Program - 5

```
//Initialize two-character variables in a
program and display the characters in
alphabetical order.

package LAB_02;

public class prg_05_CharacterOrder {
    public static void main(String[] args) {
        char char1 = 'b';
        char char2 = 'a';

        System.out.println("Characters in
alphabetical order:");
        if (char1 < char2) {
            System.out.println(char1 + " " +
char2);
        } else {
            System.out.println(char2 + " " +
char1);
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_02> java .\prg_01_CharacterOrder.java
Characters in alphabetical order:
a b
```

Program - 6

```java
//Write a program to receive a colour
code from the user (an Alphabet).

package LAB_02;

import java.util.Scanner;

public class prg_06_ColourCode {
    public static void main(String[]
args) {
        Scanner scanner = new
Scanner(System.in);

        System.out.print("Enter a colour
code (Alphabet): ");
        char colorCode =
scanner.next().charAt(0);

        System.out.println("Entered
colour code: " + colorCode);

        scanner.close();
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_02> java .\prg_02_ColourCode.java
Enter a colour code (Alphabet): p
Entered colour code: p
```

Program - 7

```
//Write a program to print even
numbers between 23 and 57.

package LAB_02;

public class prg_07_EvenNumbers {
    public static void main(String[]
args) {
        System.out.println("Even
numbers between 23 and 57:");
        for (int i = 23; i <= 57;
i++) {
            if (i % 2 == 0) {
                System.out.print(i);
                System.out.print("
");
            } else
                continue;
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_02> java .\prg_03_EvenNumbers.java
Even numbers between 23 and 57:
24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56
```

Program - 8

```
//Write a program to print in Floyd's
format (using for and while loop).

package LAB_02;

public class prg_08_FloydsFormat {
    public static void main(String[]
args) {
        int n = 5; // Change this value
for a different number of rows
        int num = 1;

        for (int i = 1; i <= n; i++) {
            for (int j = 1; j <= i; j++)
{
                System.out.print(num + "
");
                num++;
            }
            System.out.println();
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_02> java .\prg_04_FloydsFormat.java
1
2 3
4 5 6
7 8 9 10
11 12 13 14 15
```

Program - 9

```java
//Write a Java program to find if the given number is palindrome
or not.

package LAB_02;
import java.util.Scanner;

public class prg_09_PalindromeCheck {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int number = scanner.nextInt();

        if (isPalindrome(number))
            System.out.println(number + " is a palindrome.");
        else
            System.out.println(number + " is not a palindrome.");
        scanner.close();
    }
    private static boolean isPalindrome(int num) {
        int originalNum = num;
        int reversedNum = 0;
        while (num > 0) {
            int digit = num % 10;
            reversedNum = reversedNum * 10 + digit;
            num /= 10;
        }
        return originalNum == reversedNum;
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_02> java .\prg_05_PalindromeCheck.java
Enter a number: 10101
10101 is a palindrome.
```

Lab Exercise - 3

Program - 10

```
//Initialize an integer array with ASCII values and print the corresponding character values in a single row.

package LAB_03;

public class prg_10_AsciiToChar {
    public static void main(String[] args) {
        int[] asciiArray = { 65, 66, 67, 97, 98, 99 }; // Example ASCII values

        System.out.print("Corresponding characters: ");
        for (int asciiValue : asciiArray) {
            System.out.print((char) asciiValue + " ");
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_03> java .\prg_01_AsciiToChar.java
Corresponding characters: A B C a b c
```

Program – 11

```
//Write a program to reverse the elements of
a given 2*2 array. Four integer numbers need
to be passed as Command-Line arguments.

package LAB_03;

public class prg_11_Reverse2DArray {

    public static void main(String[] args) {
        if (args.length != 4) {
            System.out.println("Please
provide exactly 4 integers as command-line
arguments.");
            return;
        }

        int[][] matrix = { {
Integer.parseInt(args[0]),
Integer.parseInt(args[1]) },
                { Integer.parseInt(args[2]),
Integer.parseInt(args[3]) } };

        System.out.println("Original 2*2
Array:");
        print2DArray(matrix);

        System.out.println("Reversed 2*2
Array:");
        reverse2DArray(matrix);
        print2DArray(matrix);
```

```java
    }

    private static void reverse2DArray(int[][] array) {
        int temp = array[0][0];
        array[0][0] = array[1][1];
        array[1][1] = temp;

        temp = array[0][1];
        array[0][1] = array[1][0];
        array[1][0] = temp;
    }

    private static void print2DArray(int[][] array) {
        for (int[] row : array) {
            for (int element : row) {
                System.out.print(element + " ");
            }
            System.out.println();
        }
    }

}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_03> java .\prg_02_Reverse2DArray.java 10 20 30 40
Original 2*2 Array:
10 20
30 40
Reversed 2*2 Array:
40 30
20 10
```

Program - 12

```
package LAB_03;

class Node {
    int data;
    Node next;

    public Node(int d) {
        data = d;
        next = null;
    }
}

public class prg_12_Stack_LL {
    static class Stacks {
        public static Node Top;
        public static int Size;

        boolean IsEmpty() {
            return (Top == null);
        }

        void Push(int data) {
            Node NewNode = new Node(data);
            if (IsEmpty()) {
                Top = NewNode;
                Size++;
                return;
            }
            NewNode.next = Top;
            Top = NewNode;
```

```
            Size++;
        }

        void Pop() {
            if (IsEmpty()) {
                System.out.println("THE STACK
IS EMPTY , DELETION NOT POSSIBLE");
                return;
            }
            Node Temp = Top;
            Top = Top.next;
            Temp.next = null;
            Size--;
        }

        void Peek() {
            if (IsEmpty()) {
                System.out.println("THE STACK
IS EMPTY , PEEK NOT POSSIBLE");
                return;
            }
            System.out.println("THE TOP OF
THE IS ::: " + Top.data);
        }

        void Size_Stack() {
            System.out.println("THE SIZE OF
THE STACK IS ::: " + Size);
        }

        void Display() {
            System.out.print("THE STACK IS
::: (Top) --> ");
```

```
            Node temp = Top;
            while (temp != null) {
                System.out.print(temp.data +
" ");
                temp = temp.next;
            }
            System.out.println();
        }
    }

    public static void main(String args[]) {
        Stacks S1 = new Stacks();
        System.out.println();
        System.out.println();
        S1.Push(1);
        S1.Push(2);
        S1.Push(3);
        S1.Push(4);
        S1.Push(5);
        S1.Display();
        S1.Pop();
        S1.Display();
        S1.Peek();
        S1.Size_Stack();
        System.out.println();
    }
}
```

```
THE STACK IS ::: (Top) --> 5 4 3 2 1
THE STACK IS ::: (Top) --> 4 3 2 1
THE TOP OF THE IS ::: 4
THE SIZE OF THE STACK IS ::: 4
```

Program - 13

```java
package LAB_03;

class Node {
    int data;
    Node next;
    public Node(int d) {
        data = d;
        next = null;
    }
}

public class prg_13_Queue_LL {
    static class Queues {
        public static Node Front;
        public static Node Rear;
        public static int Size;
        boolean IsEmpty() {
            return (Rear == null);
        }
        void Enqueue(int data) {
            Node NewNode = new Node(data);
            if (IsEmpty()) {
                Front = Rear = NewNode;
                Size++;
                return;
            }
            Rear.next = NewNode;
            Rear = NewNode;
            Size++;
        }

        void Dequeue() {
            if (IsEmpty()) {
```

```
                System.out.println("THE STACK IS
EMPTY , DELETION NOT POSSIBLE");
                return;
            }
            Node Temp = Front;
            Front = Front.next;
            Temp.next = null;
            Size--;
        }

        void Peek_First() {
            if (IsEmpty()) {
                System.out.println("THE QUEUE IS
EMPTY , PEEK NOT POSSIBLE");
                return;
            }
            System.out.println("THE FRONT OF THE
QUEUE IS ::: " + Front.data);
        }
        void Peek_Last() {
            if (IsEmpty()) {
                System.out.println("THE QUEUE IS
EMPTY , PEEK NOT POSSIBLE");
                return;
            }
            System.out.println("THE REAR OF THE
QUEUE IS ::: " + Rear.data);
        }
        void Size_Queue() {
            System.out.println("THE SIZE OF THE
QUEUE IS ::: " + Size);
        }
        void Display() {
            System.out.print("THE QUEUE IS :::
(Front) --> ");
            Node temp = Front;
```

```java
            while (temp != null) {
                System.out.print(temp.data + " ");
                temp = temp.next;
            }
            System.out.println("<-- (Rear)");
        }
    }

    public static void main(String args[]) {
        Queues q = new Queues();
        System.out.println();
        System.out.println();
        q.Enqueue(1);
        q.Enqueue(2);
        q.Enqueue(3);
        q.Enqueue(4);
        q.Enqueue(5);
        q.Display();
        q.Dequeue();
        q.Display();
        q.Peek_First();
        q.Peek_Last();
        q.Size_Queue();
        System.out.println();
    }
}
```

```
THE QUEUE IS ::: (Front) --> 1 2 3 4 5 <-- (Rear)
THE QUEUE IS ::: (Front) --> 2 3 4 5 <-- (Rear)
THE FRONT OF THE QUEUE IS ::: 2
THE REAR OF THE QUEUE IS ::: 5
THE SIZE OF THE QUEUE IS ::: 4
```

Program - 14

```java
//Write a Java program to produce the tokens from the given long string.

package LAB_03;

import java.util.StringTokenizer;

public class prg_14_Tokenizer {
    public static void main(String[] args) {
        String longString = "This is a long string with multiple words.";

        StringTokenizer tokenizer = new StringTokenizer(longString);

        System.out.println("Tokens:");
        while (tokenizer.hasMoreTokens()) {
            System.out.println(tokenizer.nextToken());
        }
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_03> java .\prg_04_Tokenizer.java
Tokens:
This
is
a
long
string
with
multiple
words.
```

Program – 15

```
//Using the concept of method
overloading, write methods for
calculating the area of a triangle,
circle, and rectangle.

package LAB_03;

public class prg_15_AreaCalculator
{
    public static void
main(String[] args) {
        // Example usage
        System.out.println("Area of
Triangle: " + calculateArea(5.324,
8.765));
        System.out.println("Area of
Circle: " + calculateArea(3.5));
        System.out.println("Area of
Rectangle: " + calculateArea(4,
6));
    }

    // Area of Triangle
```

```java
    private static double calculateArea(double base, double height) {
        return 0.5 * base * height;
    }

    // Area of Circle
    private static double calculateArea(double radius) {
        return Math.PI * radius * radius;
    }

    // Area of Rectangle
    private static double calculateArea(int length, int width) {
        return length * width;
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_03> java .\prg_05_AreaCalculator.java
Area of Triangle: 23.332430000000002
Area of Circle: 38.48451000647496
Area of Rectangle: 24.0
```

Lab Exercise - 4

Program - 16

```
//Create a class Box with a
parameterized constructor and a
method to calculate the volume:

package LAB_04;

public class prg_16_Box {
    private double width;
    private double height;
    private double depth;

    // Parameterized constructor
    public prg_16_Box(double width,
double height, double depth) {
        this.width = width;
        this.height = height;
        this.depth = depth;
    }
```

```java
    // Method to calculate volume
    public double calculateVolume()
{
        return width * height *
depth;
    }

    public static void
main(String[] args) {
        // Create an object of the
Box class
        prg_16_Box myBox = new
prg_16_Box(3.0, 4.0, 5.0);

        // Test the functionalities
        System.out.println("Volume
of the box: " +
myBox.calculateVolume());
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_04> java .\Box.java
Volume of the box: 60.0
```

Program - 17

```
//Write a program to display the use of this
keyword:

package LAB_04;

public class prg_17_This {
    private int value;

    // Parameterized constructor using this
keyword
    public prg_17_This(int value) {
        this.value = value;
    }

    // Method using this keyword
    public void displayValue() {
        System.out.println("Value: " +
this.value);
    }

    public static void main(String[] args) {
        // Create an object of the class
        prg_17_This obj = new prg_17_This(42);

        // Call the method to display the value
        obj.displayValue();
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_04> java .\This.java
Value: 42
```

Program - 18

```
//Write a program to count the number of instances
created for the class:

package LAB_04;

public class prg_18_InstanceCounter {
    private static int instanceCount = 0;

    // Constructor increments the instance count
    public prg_18_InstanceCounter() {
        instanceCount++;
    }

    // Static method to get the instance count
    public static int getInstanceCount() {
        return instanceCount;
    }

    public static void main(String[] args) {
        // Create instances of the class
        prg_18_InstanceCounter obj1 = new
prg_18_InstanceCounter();
        prg_18_InstanceCounter obj2 = new
prg_18_InstanceCounter();

        // Get and display the instance count
        System.out.println("Number of instances created:
" + prg_18_InstanceCounter.getInstanceCount());
    }
}
```

```
PS C:\Users\Admin\Dc
Number of instances
```

Program - 19

```java
//Java program to get the cube of a given number using a static method:

package LAB_04;

public class prg_19_CubeCalculator {
    // Static method to calculate the cube
    public static double calculateCube(double number) {
        return Math.pow(number, 3);
    }

    public static void main(String[] args) {
        // Test the static method
        double result = prg_19_CubeCalculator.calculateCube(4.0);
        System.out.println("Cube of the given number: " + result);
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java\LAB_04> java .\CubeCalculator.java
Cube of the given number: 64.0
```

Lab Exercise - 5

Program – 20

```java
//Implement Method Overriding:

package LAB_05;

class Animal {
    void sound() {
        System.out.println("Animal makes a sound");
    }
}

class Dog extends Animal {
    void sound() {
        System.out.println("Dog barks");
    }
}

public class prg_20_MethodOverriding {
    public static void main(String[] args) {
        Animal animal = new Dog();
        animal.sound(); // Calls the overridden method in
Dog class
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java>  & 'C:\Users\Admin\AppData\Lo
 '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Admin\AppData\
c7\redhat.java\jdt_ws\Java_e1c454ad\bin' 'LAB_05.prg_20_MethodOverriding'
Dog barks
```

Program – 21

```
//Illustrate Simple Inheritance:

package LAB_05;

class Parent {
    void display() {
        System.out.println("This is the parent
class");
    }
}

class Child extends Parent {
    void show() {
        System.out.println("This is the child
class");
    }
}

public class prg_21_SimpleInheritance {
    public static void main(String[] args) {
        Child childObj = new Child();
        childObj.display(); // Accessing method
from the parent class
        childObj.show(); // Accessing method from
the child class
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java>  & 'C:\Users\Admin\AppData\Loc
 '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Admin\AppData\R
c7\redhat.java\jdt_ws\Java_e1c454ad\bin' 'LAB_05.prg_21_SimpleInheritance'
This is the parent class
This is the child class
```

Program – 22

```
//Illustrate Multilevel Inheritance:

package LAB_05;

class Vehicle {
    void start() {
        System.out.println("Vehicle
started");
    }
}

class Car extends Vehicle {
    void accelerate() {
        System.out.println("Car is
accelerating");
    }
}

class SportsCar extends Car {
    void turboCharge() {
        System.out.println("Sports car
turbocharged");
    }
}
```

```java
public class
prg_22_MultilevelInheritance {
    public static void main(String[]
args) {
        SportsCar sportsCarObj = new
SportsCar();
        sportsCarObj.start(); //
Accessing method from the Vehicle
class
        sportsCarObj.accelerate(); //
Accessing method from the Car class
        sportsCarObj.turboCharge(); //
Accessing method from the SportsCar
class
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java>  & 'C:\Users\Admin\AppData\Local\P
e Adoptium\jdk-17.0.10.7-hotspot\bin\java.exe' '-XX:+ShowCodeDetailsInExceptio
p' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\bd2e67f6d49f044c
c7\redhat.java\jdt_ws\Java_e1c454ad\bin' 'LAB_05.prg_22_MultilevelInheritance'
Vehicle started
Car is accelerating
Sports car turbocharged
```

Program – 23

```
// Illustrate all Uses of super
Keyword:

package LAB_05;

class Base {
    int x = 10;

    void display() {
        System.out.println("This is
the Base class");
    }
}

class Derived extends Base {
    int x = 20;

    void show() {
        int x = 30;
        System.out.println("Local
variable x: " + x);
```

```java
        System.out.println("Derived class variable x: " + this.x);
        System.out.println("Base class variable x: " + super.x);
        super.display(); // Calls the method from the Base class using super
    }
}

public class prg_23_SuperKeyword {
    public static void main(String[] args) {
        Derived derivedObj = new Derived();
        derivedObj.show();
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java>  & 'C:\Users\Admin\AppData\Local\Programs\Eclipse Ad
bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Admin\AppData\Roaming\Co
67f6d49f044c9ec56649cd963ec7\redhat.java\jdt_ws\Java_e1c454ad\bin' 'LAB_05.prg_23_SuperKeyword'
Local variable x: 30
Derived class variable x: 20
Base class variable x: 10
This is the Base class
```

Program – 24

```
//Show Dynamic Polymorphism and
Interface Overriding:

package LAB_05;

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");
    }
```

```
}

public class
prg_24_DynamicPolymorphism {
    public static void
main(String[] args) {
        Shape circle = new
Circle();
        Shape rectangle = new
Rectangle();

        circle.draw(); // Calls
Circle's implementation of draw()
        rectangle.draw(); // Calls
Rectangle's implementation of
draw()
    }
}
```

```
PS C:\Users\Admin\Downloads\#LAB WORK\Java>  & 'C:\Users\Admin\AppData\Local
e Adoptium\jdk-17.0.10.7-hotspot\bin\java.exe' '-XX:+ShowCodeDetailsInExcept
p' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\bd2e67f6d49f04
c7\redhat.java\jdt_ws\Java_e1c454ad\bin' 'LAB_05.prg_24_DynamicPolymorphism'
Drawing Circle
Drawing Rectangle
```

Lab Exercise - 6

Program – 25

```
//WAP to create an abstract class "Shape" where
"Rectangle" & "Triangle" inherit the "Shape" class.

package LAB_06;

abstract class Shape {
    int Base, Height;

    public abstract void Show();

    public abstract void Area();
}

class Rectangle extends Shape {
    public Rectangle(int b, int h) {
        Base = b;
        Height = h;
    }

    @Override
    public void Show() {
        System.out.println("The Rectangle Has Base = " +
Base + " & Height = " + Height);
    }

    public void Area() {
        System.out.println("The Area Of Rectangle is -> "
+ (Base * Height));
    }
}

class Triangle extends Shape {
    public Triangle(int b, int h) {
        Base = b;
```

```
        Height = h;
    }

    @Override
    public void Show() {
        System.out.println("The Triangle Has Base = " +
Base + " & Height = " + Height);
    }

    public void Area() {
        System.out.println("The Area Of Triangle is -> "
+ (0.5 * Base * Height));
    }
}

public class prg_25_AbstractClass {
    public static void main(String args[]) {
        System.out.println();
        Shape s = new Rectangle(10, 20);
        s.Show();
        s.Area();
        System.out.println();
        s = new Triangle(20, 20);
        s.Show();
        s.Area();
        System.out.println();
    }
}
```

```
The Rectangle Has Base = 10 & Height = 20
The Area Of Rectangle is -> 200

The Triangle Has Base = 20 & Height = 20
The Area Of Triangle is -> 200.0
```

Program – 26

```java
//WAP that creates an Interface & implements it

package LAB_06;

// Define the interface
interface MyInterface {
    // Abstract method declaration
    void myMethod();
}

// Implement the interface in a class
class MyClass implements MyInterface {
    // Implementing the abstract method from the
interface
    public void myMethod() {
        System.out.println("Implementing
myMethod() in MyClass");
    }
}

public class prg_26_Interface {
    public static void main(String[] args) {
        // Create an object of the implementing
class
        MyClass obj = new MyClass();

        // Call the method implemented from the
interface
        obj.myMethod();
    }
}
```

```
Implementing myMethod() in MyClass
```

Program – 27

```
/*
Write an interface "playable" with a method void
"play()", let this Interface be placed in a package
called "music".
Write a class "Veena" which implement the "playable"
interface, let this class be placed in a package called
"music.string".
Write a class "saxophone" which implement the "playable"
interface, let this class be placed in a package called
"music.wind".
Write another class "test" in package "live". Then ->
(i) create an instance of "Veena" and call the "play()"
method
(ii) create an instance of "saxophone" and Call the
"play()" method
(iii) place the above instances in a variable of type
"playable" and then call "play())"
*/
```

playable.java

```java
package LAB_06.prg_27_PackageInterface.live.music;

public interface playable {
    void play();
}
```

veena.java

```java
package
LAB_06.prg_27_PackageInterface.live.music.string;
```

```java
import
LAB_06.prg_27_PackageInterface.live.music.playable
;

public class veena implements playable {
    String name;

    public veena(String n) {
        this.name = n;
    }

    @Override
    public void play() {
        System.out.println(name + "can play veena
well!");
    }

    public static void main(String[] args) {
        playable p = new veena("Amit ");
        p.play();
    }
}
```

saxophone.java

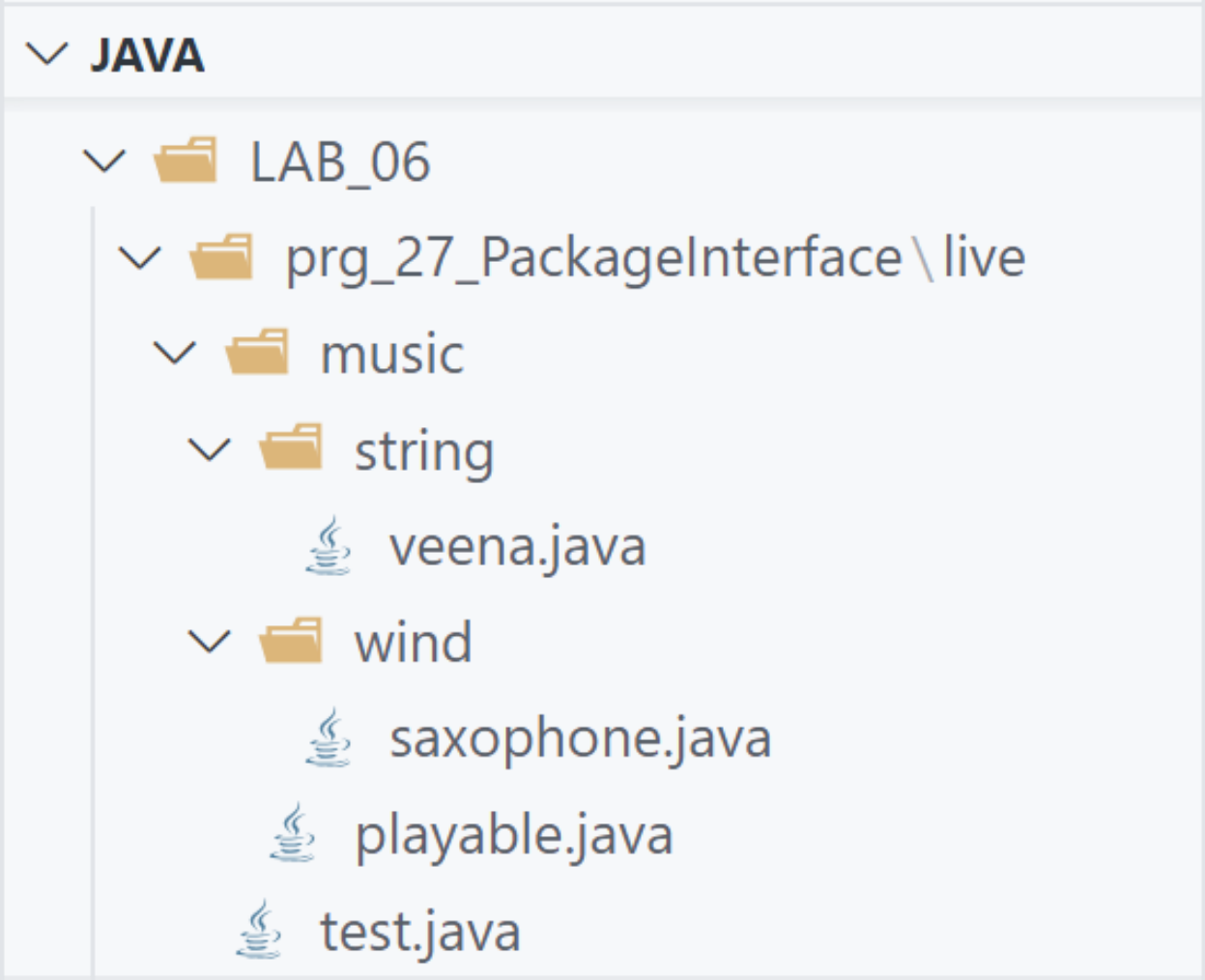
```java
package
LAB_06.prg_27_PackageInterface.live.music.wind;

import
LAB_06.prg_27_PackageInterface.live.music.playable
;

public class saxophone implements playable {
    String name;

    public saxophone(String n) {
```

```
        this.name = n;
    }

    @Override
    public void play() {
        System.out.println(name + "can play
saxophone well!");
    }

    public static void main(String[] args) {
        playable p = new saxophone("Amit ");
        p.play();
    }
}
```

test.java

```
package LAB_06.prg_27_PackageInterface.live;

import
LAB_06.prg_27_PackageInterface.live.music.playable
;
import
LAB_06.prg_27_PackageInterface.live.music.string.v
eena;
import
LAB_06.prg_27_PackageInterface.live.music.wind.sax
ophone;

public class test {
    public static void main(String[] args) {
        System.out.print("Instance of Veena Class
: ");
        veena v = new veena("Amit ");
        v.play();
```

```java
        System.out.print("Instance of Saxophone
Class : ");
        saxophone s = new saxophone("Amit ");
        s.play();
        System.out.println("Instance of Playable
Interface ->");
        playable p = new veena("Amit ");
        p.play();
        p = new saxophone("Amit ");
        p.play();
    }
}
```




```
Instance of Veena Class : Amit can play veena well!
Instance of Saxophone Class : Amit can play saxophone well!
Instance of Playable Interface ->
Amit can play veena well!
Amit can play saxophone well!
```

Lab Exercise - 7

Program – 28

```
//WAP to accept name & age of a person from the user.
Ensure that entered age is between 15 & 60. Display
proper error message & the program must execute
gracefully after displaying the error message in case the
argument pass is not proper.

package LAB_07;

import java.util.*;

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

public class prg_28_Exception {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println();
        String name;
        int Age;
        try {
            System.out.print("Enter your Name -> ");
            name = sc.nextLine();
            System.out.print("Enter your Age -> ");
            Age = sc.nextInt();
            System.out.println();
            if (Age < 15) {
                throw new MyException(name + " Age is " +
Age + " Which Is Less Than 15 Years");

            } else if (Age > 60) {
```

```
                throw new MyException(name + " Age is " +
Age + " Which Is More Than 60 Years");

            } else {
                System.out.println(name + " Age is ::: "
+ Age);

            }
        } catch (Exception e) {
            System.out.println("Error : " + e);
        } finally {
            System.out.println("Finally Program is
Finished...");
            System.out.println();
            sc.close();
        }
    }
}
```

```
Enter your Name -> Amit
Enter your Age -> 14
Error : LAB_07.MyException: Amit Age is 14 Which Is Less Than 15 Years
Finally Program is Finished...
```

```
Enter your Name -> Shaswat
Enter your Age -> 20

Shaswat Age is ::: 20
Finally Program is Finished...
```

```
Enter your Name -> Dadaji
Enter your Age -> 69

Error : LAB_07.MyException: Dadaji Age is 69 Which Is More Than 60 Years
Finally Program is Finished...
```

Program – 29

```
//WAP to create a customized exception & also make use of all the 5
exception keywords.

package LAB_07;

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

public class prg_29_CustomException {
    public static void CheckException(String Name, int Age) {
        try {
            Check(Name, Age);
        } catch (MyException e) {
            System.out.println("Error : " + e);
        } finally {
            System.out.println("Finally Program Executed...");
            System.out.println();
        }
    }

    public static void Check(String Name, int Age) throws MyException {
        if (Age < 18) {
            throw new MyException(Name + " Is Not Eligible For Voting");
        } else {
            System.out.println(Name + " Is Eligible For Voting");
        }
    }

    public static void main(String args[]) {
        CheckException("Amit", 21);
        CheckException("Justin", 17);
    }
}
```

```
Amit Is Eligible For Voting
Finally Program Executed...

Error : LAB_07.MyException: Justin Is Not Eligible For Voting
Finally Program Executed...
```

Program – 30

//Write an applet prg that displays "Hello World" with background color "black", text color "blue" and your name in the status window.

.java file

```java
package LAB_07;

import java.applet.*;
import java.awt.*;

public class prg_30_Applet1 extends Applet {
    public void paint(Graphics g) {
        g.setColor(Color.blue);
        g.drawString("Hello World", 50, 50);
    }
}
```

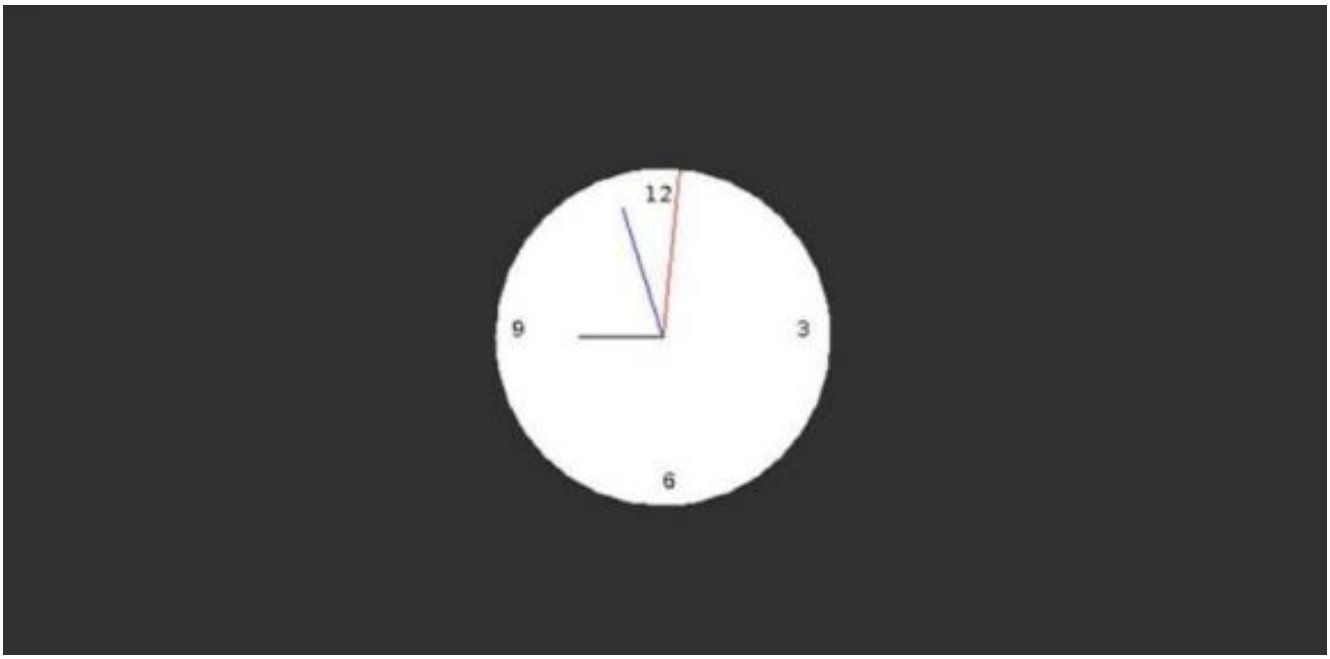
.html file

```html
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Hello World</title>
  </head>
  <body>
    <applet code="prg_30_Applet1.class" width="300" height="300"></applet>
  </body>
</html>
```

Program – 31

```java
//Develop an Analog Clock using applet.

package LAB_07;

import java.applet.*;
import java.awt.*;
import java.util.*;

public class prg_31_Applet2 extends Applet {
    @Override
    public void init() {
        this.setSize(new Dimension(800, 400));
        setBackground(new Color(50, 50, 50));
        new Thread() {
            @Override
            public void run() {
                while (true) {
                    repaint();
                    delayAnimation();
                }
            }
        }.start();
    }

    private void delayAnimation() {
        try {
            Thread.sleep(1000);
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    }

    @Override
    public void paint(Graphics g) {
        // Get the system time
        Calendar time = Calendar.getInstance();
        int hour = time.get(Calendar.HOUR_OF_DAY);
        int minute = time.get(Calendar.MINUTE);
        int second = time.get(Calendar.SECOND);
        // 12 hour format
        if (hour > 12) {
            hour -= 12;
        }
        // Draw clock body center at (400, 200)
        g.setColor(Color.white);
        g.fillOval(300, 100, 200, 200);
        // Labeling
        g.setColor(Color.black);
```

```
        g.drawString("12", 390, 120);
        g.drawString("9", 310, 200);
        g.drawString("6", 400, 290);
        g.drawString("3", 480, 200);
        // Declaring variables to be used
        double angle;
        int x, y;
        // Second hand's angle in Radian
        angle = Math.toRadians((15 - second) * 6);
        // Position of the second hand with length 100 unit
        x = (int) (Math.cos(angle) * 100);
        y = (int) (Math.sin(angle) * 100);
        // Red color second hand
        g.setColor(Color.red);
        g.drawLine(400, 200, 400 + x, 200 - y);
        // Minute hand's angle in Radian
        angle = Math.toRadians((15 - minute) * 6);
        // Position of the minute hand
        // with length 80 unit
        x = (int) (Math.cos(angle) * 80);
        y = (int) (Math.sin(angle) * 80);
        // blue color Minute hand
        g.setColor(Color.blue);
        g.drawLine(400, 200, 400 + x, 200 - y);
        // Hour hand's angle in Radian
        angle = Math.toRadians((15 - (hour * 5)) * 6);
        // Position of the hour hand
        // with length 50 unit
        x = (int) (Math.cos(angle) * 50);
        y = (int) (Math.sin(angle) * 50);
        // Black color hour hand
        g.setColor(Color.black);
        g.drawLine(400, 200, 400 + x, 200 - y);
    }
}
```



Lab Exercise - 8

Program – 32

```
//WAP to show Multi-Threading

package LAB_08;

class Base {
    int num;
    boolean ValueSet = false;

    public synchronized void Put(int n) {
        while (ValueSet == true) {
            try {
                wait();
            } catch (Exception e) {
            }
        }
        System.out.println("Put -->  num : " + n);
        this.num = n;
        ValueSet = true;
        notify();
    }

    public synchronized void Get() {
        while (ValueSet == false) {
            try {
                wait();
            } catch (Exception e) {
            }
        }
        System.out.println("Get -->  num : " + num);
        ValueSet = false;
        notify();
    }
}

class Producer implements Runnable {
    Base Obj;

    public Producer(Base b) {
        this.Obj = b;
        Thread T1 = new Thread(this, "Producer");
        T1.start();
    }

    @Override
```

```java
    public void run() {
        int i = 0;
        while (i <= 5) {
            Obj.Put(i++);
            try {
                Thread.sleep(1000);
            } catch (Exception e) {
                e.getStackTrace();
            }
        }
    }
}

class Consumer implements Runnable {
    Base Obj;

    public Consumer(Base b) {
        this.Obj = b;
        Thread T2 = new Thread(this, "Consumer");
        T2.start();
    }

    @Override
    public void run() {
        int i = 0;
        while (i <= 5) {
            Obj.Get();
            try {
                Thread.sleep(2000);
            } catch (Exception e) {
                e.getStackTrace();
            }
        }
    }
}

public class prg_32_MultiThread {
    public static void main(String args[]) {
        Base Obj = new Base();
        Producer P = new Producer(Obj);
        Consumer C = new Consumer(Obj);
    }
}
```

```
Put -->  num : 0
Get -->  num : 0
Put -->  num : 1
Get -->  num : 1
Put -->  num : 2
Get -->  num : 2
Put -->  num : 3
Get -->  num : 3
Put -->  num : 4
Get -->  num : 4
Put -->  num : 5
Get -->  num : 5
```

Program – 33

```
//WAP that executes to threads. One thread displays "An" after every 1000ms &
the other displays "B" after every 3000ms. Create the threads by executing the
thread class.

package LAB_08;

class First extends Thread {
    public void run() {
        for (int i = 0; i < 9; i++) {
            System.out.print("An    ");
            try {
                Thread.sleep(1000);
            } catch (Exception e) {
            }
        }
    }
}

class Second extends Thread {
    public void run() {
        for (int i = 0; i < 3; i++) {
            System.out.println("\nB    ");
            try {
                Thread.sleep(3000);
            } catch (Exception e) {
            }
        }
    }
}

public class prg_33_Thread1 {
    public static void main(String args[]) {
        System.out.println();
        First F = new First();
        Second S = new Second();
        F.start();
        try {
            Thread.sleep(3000);
        } catch (Exception e) {
        }
        S.start();
    }
}
```

```
An      An      An
B
An      An      An
B
An      An      An
B
```

Program – 34

```
//WAP & Create a class "salesperson" as a thread that
will display a salesperson name. Create a class "days" as
other thread that has array of 7 days. Call the instance
of "salesperson" in "days" and start both the threads.
Suspend the sales person on Sunday & resume on Wednesday.
We can only use suspend and resume methods
from the thread only.

package LAB_08;

class SalesPerson extends Thread {
    public String name;

    public SalesPerson(String n) {
        this.name = n;
    }

    public void run() {
        System.out.println("Sales_Person " + name + "
reporting for duty.");
        System.out.println();
    }
}

class Days extends Thread {
    String[] days = { "Sunday", "Monday", "Tuesday",
"Wednesday", "Thursday", "Friday", "Saturday" };
    SalesPerson salesPerson;

    public Days(SalesPerson salesPerson) {
        this.salesPerson = salesPerson;
    }

    public void run() {
        for (String day : days) {
            if (day.equals("Sunday")) {
                System.out.println("Sales_Person " +
salesPerson.name + " suspended shop on : " + day);
```

```
                // salesPerson.suspend();
            } else if (day.equals("Monday") ||
day.equals("Tuesday")) {
                continue;
            } else if (day.equals("Wednesday")) {
                System.out.println("Sales_Person " +
salesPerson.name + " resumed shop on : " + day);
            } else {
                System.out.println("Sales_Person " +
salesPerson.name + " continued shop on : " + day);
            }
        }
    }
}

public class prg_34_Thread2 {
    public static void main(String args[]) throws
Exception {
        System.out.println();
        SalesPerson SP = new SalesPerson("Amit");
        Days DP = new Days(SP);
        SP.start();
        DP.start();
        SP.join();
        DP.join();
        System.out.println();
    }
}
```

```
Sales_Person Amit reporting for duty.

Sales_Person Amit suspended shop on : Sunday
Sales_Person Amit resumed shop on : Wednesday
Sales_Person Amit continued shop on : Thursday
Sales_Person Amit continued shop on : Friday
Sales_Person Amit continued shop on : Saturday
```

Program – 35

```
//WAP that read & write in the file.

package LAB_08;

import java.io.*;
import java.util.*;

public class prg_35_FileHandling {
    public static void main(String args[]) {
        try {
            File myFile = new File("D:\\Admin\\B.Tech\\LAB-
WORK\\Java\\LAB_09\\prg_35_FileHandling.txt");
            myFile.createNewFile();
            FileWriter WriteFile = new FileWriter("D:\\Admin\\B.Tech\\LAB-
WORK\\Java\\LAB_09\\prg_35_FileHandling.txt");
            WriteFile.write("Hello, I Am Amit Singhal\nI Am 18 Years Old\n");
            WriteFile.write("Java is my Favourite Subject");
            WriteFile.close();
            Scanner sc = new Scanner(myFile);
            while (sc.hasNextLine()) {
                String line = sc.nextLine();
                System.out.println(line);
            }
            sc.close();
            myFile.delete();
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

➔ TXT FILE

prg_35_FileHandling - Notepad

File Edit Format View Help

```
Hello, I Am Amit Singhal
I Am 18 Years Old
Java is my Favourite Subject
```

```
Hello, I Am Amit Singhal
I Am 18 Years Old
Java is my Favourite Subject
```