Laboratory Work

Subject: Java Technologies

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LAB 01

Topics: print(), println(), Scanner class, 1-D, 2-D array, jagged array

1. Write a Java program to display "Hello World".
Code:-

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

        System.out.println("Hello World");

    }

}
```

Output:-
Hello World

2. Write a Java program to print numbers between 1 to n which are divisible by 3, 5 and by both(3 and 5) by taking n as an input from the user.
Code:-

```
import java.util.Scanner;

class number{
    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        int n=sc.nextInt();
        System.out.println("Divisible by 3");
        for(int i=1;i<=n;i++){
          if(i%3==0){
            System.out.println(i);
          }
        }
        System.out.println("Divisible by 5");
```

```java
    for(int i=1;i<=n;i++){
      if(i%5==0){
        System.out.println(i);
      }
    }
    System.out.println("Divisible by 3 and 5");
    for(int i=1;i<=n;i++){
      if((i%3==0) && (i%5==0)){
        System.out.println(i);
      }
    }

  }
}
```
Output:-
20
Divisible by 3
3
6
9
12
15
18
Divisible by 5
5
10
15
20
Divisible by 3 and 5
15

3. Write a class named Greeter that prompts the user for his or her name, and then prints a personalized greeting. As an example, if the user entered Era, the program should respond Hello Era!
Code:-

```java
import java.util.Scanner;

class Greeter{
    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter Your Name");
        String name=sc.nextLine();
        System.out.println("Hello "+name);
    }
}
```

Output:-

4. Write a Java program that takes Name, Roll No and marks of 5 subjects as input and gives a formatted output as:
Name: ABCD
Roll No. : 1
Average: 84
Also display the grade (e.g. A, B, C…etc) using the average.

Code:-

```java
import java.util.Scanner;

class Student{
  String name;
  String roll_no;
  int[] marks=new int[5];
  double average=0;
  int sum=0;
    Student(String name,String roll_no,int[] marks){
      this.name=name;
      this.roll_no=roll_no;
      this.marks=marks;
      for(int i=0;i<marks.length;i++){
        sum+=marks[i];
      }
      average=(double)sum/5.0;
    }
  public void displayData(){
    System.out.println("Name: "+this.name);
    System.out.println("Roll No: "+this.roll_no);
    System.out.println("Average: "+average);
    if(average>90){
      System.out.println("Your Grade is A");
    }
    else if(average>80){
      System.out.println("Your Grade is B");
    }
    else if(average>70){
      System.out.println("Your Grade is C");
    }
    else if(average>60){
```

```java
            System.out.println("Your Grade is D");
        }
        else if(average>50){
            System.out.println("Your Grade is E");
        }
        else if(average>40){
            System.out.println("Fail");
        }
    }

}


class Main{
    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        String name,roll_no;
        int[] marks=new int[5];
        System.out.println("Enter Your Name");
        name=sc.nextLine();
        System.out.println("Enter your Roll No");
        roll_no=sc.nextLine();
        System.out.println("Enter Marks for Five Subjects");
        for(int i=0;i<5;i++){
            marks[i]=sc.nextInt();
        }
        Student s=new Student(name,roll_no,marks);
        s.displayData();
    }
}
```
Output:-
Enter Your Name
Akshay
Enter Your Roll No
CE012
Enter Marks for five subjects
98
86
99
93
89
Name: Akshay
Roll no: CE012
Average: 93.0
Your Grade is A

5. Calculate and return the sum of all the even numbers present in the numbers array passed to the method calculateSumOfEvenNumbers. Implement the logic inside calculateSumOfEvenNumbers() method.

Code:-
```java
import java.util.Scanner;

class SumEven{
    public static int calculateSumOfEvenNumbers(int[] array){
        int sum=0;
        for(int i:array){
            if(0==i%2){
                sum+=i;
```

```java
            }
          }
          return sum;
        }
    }


    class Tester{
        public static void main(String[] args){
            Scanner sc=new Scanner(System.in);
            System.out.println("Enter size of array");
            int size=sc.nextInt();
            int[] array=new int[size];
            System.out.println("Enter values for array");
            for(int i=0;i<size;i++){
                array[i]=sc.nextInt();
            }
            System.out.println("sum of even numbers present in array are
    "+SumEven.calculateSumOfEvenNumbers(array));
        }
    }
```

Output:-

Enter size of array

10

Enter values for array

1

2

3

4

5

6

7

8

9

10

sum of even numbers present in array are 30

6. Write a program to perform matrix addition and matrix multiplication on two given matrices. Use for-each form of for loop to display the matrices.
Code:-

```java
import java.util.Scanner;

class Matrix{
    static void displayMatrix(int[][] m){
        for(int[] l:m){
          for(int i:l){
            System.out.print(i+" ");
          }
          System.out.println();
        }
    }
    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter Size of matrix");
        int n=sc.nextInt();
        int[][] m1=new int[n][n];
        int[][] m2=new int[n][n];
        System.out.println("Enter elements for first matrix");
        for(int i=0;i<n;i++){
          for(int j=0;j<n;j++){
            m1[i][j]=sc.nextInt();
          }
        }
        System.out.println("Enter elements for Second matrix");
        for(int i=0;i<n;i++){
          for(int j=0;j<n;j++){
            m2[i][j]=sc.nextInt();
          }
        }
        int[][] addition=new int[n][n];
        int[][] multiplication=new int[n][n];
        for(int i=0;i<n;i++){
          for(int j=0;j<n;j++){
            addition[i][j]=m1[i][j]+m2[i][j];
            int sum=0;
            for(int k=0;k<n;k++){
              sum+=(m1[i][k]*m2[k][j]);
            }
            multiplication[i][j]=sum;
          }

        }
        System.out.println("Addition of both matrix is ");
        displayMatrix(addition);
        System.out.println("multiplication of both matrix is ");
        displayMatrix(multiplication);
```

```
    }
  }
```
Output:-

Enter Size of matrix

2

Enter elements for first matrix

6 8

5 6

Enter elements for second matrix

4 8

9 6

addition of both matrix is

10 16

14 12

multiplication of both matrix is

96 96

74 76

LAB 02

Topics: String, StringBuffer, StringBuilder, array of objects, this keyword,constructor overloading

1. Write a program that returns the number of times that the string "hi" appears anywhere in the given string.
Code:-

```
import java.util.Scanner;
class Main{
        public static void main(String[] args){
           Scanner sc=new Scanner(System.in);
           String s;
           System.out.println("Enter String");
           s=sc.nextLine();
           int lastIndex=0;
           int count=0;

           while(lastIndex!=-1){
                lastIndex=s.indexOf("hi",lastIndex);
                if(lastIndex!=-1){
                  lastIndex+=1;
                  count++;
                }
           }
           System.out.println("Occurence of hi is string is "+count);
        }
}
```
Output:-

```
Enter String
Hihihihiakshayiakdkghi
Occurrence of hi is string is 6
```

2. Write a program which checks whether the input string is palindrome or not and then display an appropriate message [e.g. "Refer" is a palindrome string].
Code:-

```
import java.util.Scanner;
class PaString{
        public static void main(String[] args){
           Scanner sc=new Scanner(System.in);
           String s;
           System.out.println("Enter String");
           s=sc.nextLine();

           StringBuffer sb=new StringBuffer(s);
           sb.reverse();

           String rs=sb.toString();
           sb.reverse();
           s=sb.toString();
```

```
          if(rs.equalsIgnoreCase(s)){
                System.out.println("String is pallindrom");
          }
          else{
                System.out.println("String is not pallindrom");
          }
        }
}
```

Output:-
Enter String
Refer
String is palindrom

3. Write a program that takes your full name as input and displays the abbreviations of the first and middle names except the last name which is displayed as it is. For example, if your name is Robert Brett Roser, then the output should be R.B.Roser.
Code:-
```
import java.util.Scanner;
class People{
        public static void main(String[] args){
            Scanner sc=new Scanner(System.in);
            String s;
            System.out.println("Enter Your Full Name");
            s=sc.nextLine();
            String[] name=s.split(" ");

            System.out.println(name[0].charAt(0)+"."+name[1].charAt(0)+"."+name[2]);


        }
}
```
Output:-
Enter Your Full Name
Rober Brett Roser
R.B.Roser

4. Write a method String removeWhiteSpaces(String str) method that removes all the white spaces from the string passed to the method and returns the modified string. Test the functionalities using the main() method of the Tester class.
Code:-
```
import java.util.Scanner;
```

```java
class WhiteSpaceRemove{
    public static String removeWhiteSpaces(String s){
        String as[]=s.split(" ");
        String ans="";
        for(String x : as){
          ans=ans+x;
        }
          return ans;
    }

}
class Tester{
        public static void main(String[] args){
           Scanner sc=new Scanner(System.in);
           String s;
           System.out.println("Enter a String");
           s=sc.nextLine();
           s=WhiteSpaceRemove.removeWhiteSpaces(s);
           System.out.println(s);
          }
}
```

Output:-

```
Enter a String
Ab cd ef gh is js kdg lkdj
abcdefghisjskdglkdj
```

5. Write a class Student with member variables int roll_no, String name and an array to store marks of 5 subjects. Demonstrate constructor overloading and use this keyword. Write a findAverage() method that returns double value. Write a TestStudent class containing main() method to do the following:
a) Store the details of one student by creating one object of Student class and display them.
b) Store the details of 3 students by creating an array of objects of Student class and display the details of the student who has the highest average amongst the three students.

Code:-
```java
import java.util.Scanner;
class Student{
        int roll_no;
        String name;
        int marks[];
        double avg;
        public static double highAvg=0;
        Student(){
```

```java
        }
        public Student(String name,int roll_no,int marks[]){
          this.roll_no=roll_no;
          this.name=name;
          this.marks=marks;
        }
        public double findAverage(){
                int sum=0;
                for(int i=0;i<marks.length;i++){
                   sum+=marks[i];
                }

                avg=(double)sum/5.0;
                return avg;
        }
        public void disPlay(){
                System.out.println("Name of student is "+this.name);
                System.out.println("roll_no of student is "+this.roll_no);
                System.out.println("Marks of 5 subject is ");
                for(int i:marks){
                   System.out.print(i+" ");
                }
                System.out.println();
                System.out.println("average mark of student is "+findAverage());
        }

}

class TestStudent{
        public static void main(String[] args){
            Scanner sc=new Scanner(System.in);
            System.out.println("This is task A");
            System.out.println("Enter name for studnet");
            String name;
            int roll_no;
            int marks[]=new int[5];
            name=sc.nextLine();
            System.out.println("Enter roll number for "+name);
            roll_no=sc.nextInt();
            System.out.println("Enter marks of 5 subject for "+name);
            for(int i=0;i<5;i++){
                marks[i]=sc.nextInt();
            }
            Student s1=new Student(name,roll_no,marks);
            s1.disPlay();
            System.out.println("This is task B");
            Student s[]=new Student[3];


            int i;
            int ind=-1;
            for(i=0;i<3;i++){
```

```java
                System.out.println("Enter name for studnet "+(i+1));
                marks=new int[5];
                name=sc.next();
                System.out.println("Enter roll number for "+name);
                roll_no=sc.nextInt();

                System.out.println("Enter marks of 5 subject for "+name);
                for(int j=0;j<5;j++){
                    marks[j]=sc.nextInt();
                }
                s[i]=new Student(name,roll_no,marks);
                if(s[i].findAverage()>Student.highAvg){
                    Student.highAvg=s[i].findAverage();
                    ind=i;
                }
            }
            s[ind].disPlay();

        }
    }
```

Output:-

This is task A

Enter name for student

akshay

Enter roll number for akshay

1

Enter marks of 5 subject for akshay

98

99

97

89

98

Name of student is akshay

Roll_no of student is 1

Marks of 5 subject is

98 99 97 89 98

Average mark of student is 96.2

This is taks B

Enter name for student 1

Akshay

Enter roll number for aksahy

1

Enter marks of 5 subject for akshay

99

99

99

98

97

Enter name for student 2

Niraj

Enter roll number for niraj

2

Enter marks of 5 subject for niraj

76

90

89

98

78

Enter name for student 3

Jay

Enter roll number for jay

3

Enter marks of 5 subject for jay

78

90

09

89

78

Name of student is akshay

Roll_no of student is 1

Marks of 5 subject is

99 99 99 98 97

Average mark of student is 98.4

Topics: Inheritance, Polymorphism(method overriding), static keyword

1. Write a Java program that checks for prime number using the object oriented approach.
   [Hint: create a class NumberClass with a member value and method isPrimeNumber()]

Code:-

```java
package akshay;
import java.util.*;
/**
 * @author user1
 *
 */
public class NumberClass {

    int value;
    /**
     *
     */
    public NumberClass() {
        // TODO Auto-generated constructor stub
    }

    public NumberClass(int value) {
        this.value = value;
    }

    public boolean isPrimeNumber(){

        int i;
        for(i=2;i<value;i++){
            if(value%i==0) return false;
        }

        return true;

    }
    /**
     * @param args
     */
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter a number");
        int n=sc.nextInt();
        NumberClass num=new NumberClass(n);
        if(num.isPrimeNumber()){
            System.out.println("Number is prime Number");
        }
        else{
            System.out.println("Number not a prime Number ");
        }
    }

}
```

Output:-

```
Enter a number
5
Number is prime Number
```

2. Create two classes:

class Person

Derive a class Student from class Person.

Add the following to Student class:

● a static variable count(to count the number of objects)

● a static block to initialize count variable to zero

● a static method String getCount() that returns the number of student objects created

● Write a TestStudent class containing the main() method.

● Store the details of 3 students by creating an array of objects of Student class and display the student who has highest average amongst the three students as follows using displayDetails() method for that object:

e.g.

RollNo = 100

Name = ABC

Age = 20

Marks=78 86 88 67 92

● Create one more object of the Student class and then call the getCount() to display the number of Student objects created.

Code:-

```java
package akshay;

public class Person {
	private String name;
	private int age;
	public Person() {
		// TODO Auto-generated constructor stub

	}
	public Person(String name, int age) {
		super();
		this.name = name;
		this.age = age;
	}
	public String getName() {
		return name;
	}
	public void setName(String name) {
		this.name = name;
	}
	public int getAge() {
		return age;
	}
	public void setAge(int age) {
		this.age = age;
	}
	@Override
	public String toString() {
		return "Person [name=" + name + ", age=" + age + "]";
	}
}
package akshay;
```

```java
import java.util.Arrays;

public class Student extends Person{
    private int rollno;
    private double[] marks;
    static private int count;
    private double avg;
    public double getAvg() {
            return avg;
    }
    public void setAvg(double avg) {
            this.avg = avg;
    }
    static {
    count=0;
    }
    {
      count++;
    }
    public static int getCount() {
      return count;
    }
    public Student() {
            // TODO Auto-generated constructor stub
    }
    public Student(int rollno) {
            super();
            this.rollno = rollno;
    }
    public Student(int rollno, double[] marks) {
            super();
            this.rollno = rollno;
            this.marks = marks;
            double sum=0;
            for(double x:marks) {
                    sum+=x;
            }
            this.avg=sum/marks.length;
    }
    public Student(int rollno,String name, int age,double[] marks) {
            super(name, age);
            this.rollno=rollno;
            this.marks=marks;
            double sum=0;
            for(double x:marks) {
                    sum+=x;
            }
            this.avg=sum/marks.length;
            // TODO Auto-generated constructor stub
    }
    @Override
    public String toString() {
            return "Student [rollno=" + rollno + ", marks=" +
Arrays.toString(marks) + "]";
    }
    public int getRollno() {
            return rollno;
    }
    public void setRollno(int rollno) {
            this.rollno = rollno;
    }
    public double[] getMarks() {
```

```java
                return marks;
        }
        public void setMarks(double[] marks) {
                this.marks = marks;
        }
        public void displayDetails() {
                System.out.println("name "+this.getName());
                System.out.println("age" +this.getAge());
                System.out.println("roll no "+ this.rollno);
                System.out.println("marks");
                for(int i=0;i<this.marks.length;i++) {
                        System.out.println(marks[i]);
                }
        }

}
package akshay;
import java.util.*;
public class TestStudent {

        public static void main(String[] args) {
                // TODO Auto-generated method stub
                Student[] s=new Student[3];
                Scanner sc=new Scanner(System.in);
                int mx_in=0;
                double avg=0;
                for(int i=0;i<3;i++) {
                        System.out.println("Enter name for student "+(i+1));
                        String name=sc.next();
                        System.out.println("Ente age for "+name);
                        int age=sc.nextInt();
                        System.out.println("Enter rollno for "+name);
                        int rollno=sc.nextInt();
                        System.out.println("Enter marks for "+name);
                        double[] marks=new double[5];
                        for(int i1=0;i1<5;i1++) {
                                marks[i1]=sc.nextInt();
                        }
                        s[i]=new Student(rollno,name,age,marks);
                        if(avg<s[i].getAge()) {
                                avg=s[i].getAvg();
                                mx_in=i;
                        }
                }
                s[mx_in].displayDetails();

                Student st=new Student();

                System.out.println(st.getCount());


        }
}
```

Output:-

Enter name for student 1
akshay
Enter age for akshay
18
Enter rollno for aksahy
1
Enter marks for akshay

Enter marks for akshay
99
98
98
97
99
Enter name for student 2
jay
Enter age for jay
19
Enter rollno for jay
2
Enter marks for jay
99
97
87
9
87
Enter name for student 3
Nana
Enter age for nana
19
Enter rollno for nana
3
Enter marks for nana
99
98
87
78
78
name akshay
age 19
roll no 1
marks
99.0
98.0
98.0
97.0
99.0
4

LAB 04
Topics: Interface, Exception Handling

1. <u>Write a program that catches the divide-by-zero exception using the try-catch mechanism.</u>Take a numeric value and perform division by zero. Catch the ArithmeticException.

Code:-

```
package exception;

public class Q1 {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		int x=5,y=0,z;
		try {
			z=x/y;
		}
		catch(ArithmeticException e) {
			System.out.println(e);
		}
	}

}
```

```
 / by zero
```

2. <u>Write a java program using multiple catch blocks.</u> Create a class CatchExercise inside the try block declare an array a[] and initialize with value a[5] =30/5; . In each catch block show Arithmetic exception and ArrayIndexOutOfBoundsException.

Code:-
```
package exception;

public class CatchExercise {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		try {
			int a[]=new int[5];
			a[5]=30/5;
		}
		catch(ArithmeticException e) {
			System.out.println(e);
		}
		catch(ArrayIndexOutOfBoundsException e) {
			System.out.println(e);
		}
	}

}
```

Output:-

Index 5 out of bounds for length 5

3. <u>Write a program that demonstrates use of finally block. Observe the output of your program for different cases as mentioned below.

● Case A: exception does not occur. Perform 25/5 mathematical operation. Catch the NullPointerException.

Code:-

```
package exception;

public class Q3A {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        try {
            int z=25/5;
        }
        catch(NullPointerException e) {
            System.out.println(e);
        }
        finally {
            System.out.println("finally block executes");
        }
    }

}
```

Output:-finally block executes

● Case B: exception occurs but not handled. Perform 25/0 mathematical operation. Catch NullPointerException.
Code:-

```
package exception;

public class Q3B {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        try {
            int z=25/0;
        }
        catch(NullPointerException e) {
            System.out.println(e);
        }
        finally {
            System.out.println("finally block executes");
        }
    }

}
```

Output:-

Finally block executes

● Case C: exception occurs and handled. Perform 25/0 mathematical operation. Catch ArithmeticException.
Code:-

```
package exception;

public class Q3C {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        try {
            int z=25/0;
```

```
            }
            catch(ArithmeticException e) {
                System.out.println(e);
            }
            catch(NullPointerException e) {
                System.out.println(e);
            }
            finally {
                System.out.println("finally block executes");
            }
        }

}
```

Output:-

/ by zero

Finally block executes

4. Create an interface Account with two methods: deposit and withdraw. Create class SavingsAccount which implements the interface. Write a custom Exception handler for SavingsAccount to handle the scenarios when the withdrawn amount is larger than the balance in the account. Code:-

```
// Below is interface named account
package exception;

public interface  Account  {
     void deposit(int amount);
     void withdraw(int amount);
}

//Below code for custom exception class
package exception;

public class CustomException extends Exception{
     public CustomException(String s) {
          super(s);
     }
}

//Below code for class SavingsAccount
package exception;

public class SavingsAccount implements Account {

     int balance;
     public SavingsAccount(int amount) {
          this.balance=amount;
     }
     public void deposit(int amount) {
          this.balance+=amount;
     }
     public void withdraw(int amount) {
          try {
               if(amount>this.balance)
                    throw new CustomException("amount is more than
balance");
               this.balance-=amount;
          }
```

```
        catch(CustomException e) {
            System.out.println(e);
        }
    }
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        SavingsAccount s=new SavingsAccount(2000);
        s.withdraw(3000);
    }

}
```

Output:-
Amount is more than balance