



COMP1331
Computer and programming

Manual Solution
(Lab 1 – 11)

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Lab 1 : Elementary Java Programming

Activity 1 :

```
public class Activity1 {
    public static void main(String[] args) {
        System.out.println("Welcome to Java");
        System.out.println("Welcome to Computer Science");
        System.out.println("Programming is fun");
    }
}
```

Activity 2:

```
public class Activity2 {
    public static void main(String[] args) {
        double height = 4.3 , width = 5.5;
        System.out.println("Area = width * hieght = "+ width * height);
    }
}
```

Activity 3:

```
public class Activity3 {
    public static void main(String[] args) {
        double avgSpeed , distance = 10 , time = 25.5;
        distance /= 1.6;
        time /= 60;
        avgSpeed = distance / time;
        System.out.println("Average speed (miles/h) = " + avgSpeed );
    }
}
```

Activity 4:

```
import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Enter the width of rectangle: ");
        double width = input.nextDouble();
        System.out.println("Enter the hieght of rectangle: ");
    }
}
```

```
        double hieght = input.nextDouble();

        System.out.println("The perimeter is "+ (2*width 2*hieght));
        System.out.println("The area is " + hieght * width);
    }
}
```

Activity 5:

```
import java.util.Scanner;
```

```
public class Activity5 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Please enter a celsius degree : ");
        double celsius = input.nextDouble();
        System.out.println("fahrenheit = " + (9.0/5) * celsius+32);
    }
}
```

Lab 2 : Selections

Activity 1:

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        Scanner inputPlease= new Scanner(System.in);
        System.out.print("Please enter a number:");
        int num=inputPlease.nextInt();
        switch (num) {
            case 1: System.out.println("January");
                    break;
            case 2: System.out.println("February");
                    break;
            case 3: System.out.println("March");
                    break;
            case 4: System.out.println("April");
                    break;
            case 5: System.out.println("May");
                    break;
            case 6: System.out.println("June");
                    break;
            case 7: System.out.println("July");
                    break;
            case 8: System.out.println("Agustus");
                    break;
            case 9: System.out.println("Septemper");
                    break;
            case 10: System.out.println("October");
                    break;
            case 11: System.out.println("November");
                    break;
            case 12: System.out.println("December");
                    break;
        }
    }
}
```

Activity 2:

```
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {
        double num1,num2,num3;
        Scanner inputNumbers=new Scanner (System.in);
        System.out.print("Please enter the first number");
        num1=inputNumbers.nextDouble();
        System.out.print("Please enter the second number");
        num2=inputNumbers.nextDouble();
        System.out.print("Please enter the third number");
        num3=inputNumbers.nextDouble();
    }
}
```

```

    if (num1>num2 && num1> num3)
        if (num2>num3)
            System.out.println(num3+" then "+ num2 + " then "+ num1);
        else if(num3>num2)
            System.out.println(num2+" then "+ num3 + " then "+ num1);

    else if (num2>num1 &&num2> num3)
        if (num1>num3)
            System.out.println(num3+" then "+ num1 + " then "+ num2);
        else if(num3>num1)
            System.out.println(num1+" then "+ num3 + " then "+ num2);
    else
        if (num1>num2)
            System.out.println(num2+"then"+ num1 +"then"+ num3);
        else if(num3>num1)
            System.out.println(num1+"then"+ num2 +"then"+ num3);
}
}

```

Activity 3:

```

import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        Scanner input= new Scanner(System.in);
        System.out.print("Please enter a number:");
        int x= input.nextInt();
        int rem=x%10;
        int res=x/100;

        System.out.println((rem==res) ? x+" is a palindrome" :x+" is not a palindrome"
    );
    }
}

```

Activity 4:

```

import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter the first number:");
        int n1=input.nextInt();
        System.out.print("Please enter the second number:");
        int n2=input.nextInt();
        System.out.print("Please enter the third number:");
        int n3=input.nextInt();

        if (n1+n2>n3 && n2+n3>n1 && n1+n3 >n2)
            System.out.println("Vaild triangle");
        else

```

```
        System.out.println("Invaield triangle");
    }
}
```

Activity 5 :

```
import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        Scanner inputMan= new Scanner(System.in);
        System.out.print("Please enter the first point (x1,y1:");
        double x1= inputMan.nextDouble();
        double y1= inputMan.nextDouble();
        System.out.print("Please enter the second point (x1,y1:");
        double x2= inputMan.nextDouble();
        double y2= inputMan.nextDouble();

        double m=(y2-y1)/(x2-x1);
        double b=y1-m*x1;

        System.out.println("The line equation => y="+m+"x"+b);
    }
}
```

Activity 6 :

```
import java.util.Scanner;

public class Activity6 {
    public static void main(String[] args) {
        double amount,res;
        Scanner input= new Scanner(System.in);
        System.out.print("Enter the exchange rate from $ to JOD:");
        double rate= input.nextDouble();
        System.out.print("Enter 0 to convert $ to JOD or 1 vice versa:");
        int status= input.nextInt();

        switch (status) {
            case 0: System.out.print("Enter the $ amount:");
                amount= input.nextDouble();
                res= amount*rate;
                System.out.println(amount+" $ is "+res+"JOD");
                break;

            case 1: System.out.print("Enter the JOD amount:");
                amount= input.nextDouble();
                res= amount/rate;
                System.out.println(amount+" JOD is "+res+"$");
                break;

            default: System.out.println("Incorrect input: "+status);
        }
    }
}
```

Lab 3 : Loops

Activity 1 :

```
public class Activity1 {
    public static void main(String[] args) {
        int j = 0;
        for (int i = 1; i <= 1000; i++)
            if (i % 4 == 0 ^ i % 3 == 0) {
                System.out.print(i + " ");
                j++;
                if (j % 10 == 0)
                    System.out.println();
            }
    }
}
```

Activity 2 :

```
public class Activity2 {
    public static void main(String[] args) {
        int j=0;
        for (int i=1;i<=1000;i++) {
            if (i%4==0 ^ i%3==0) {
                System.out.print(i+" ");
                j++;
                if (j%10==0)
                    System.out.println();
            }
        }
    }
}
```

Activity 2 (Even Better) :

```
import java.util.Scanner;

public class Activity2ButBetter {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        int n1 = input.nextInt(), n2 = input.nextInt();
        int d = Math.min(n1, n2);

        while (d != 0) {
            if (n1 % d == 0 && n2 % d == 0) {
                System.out.println("GCD=" + d);
                break;
            }
            d -= 1;
        }
    }
}
```

Activity 3 :

```
import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        int a = input.nextInt(), b = input.nextInt();
        int n = b, gcd = 1;
        if (a > b)
            n = a;
        for (int i = 1; i <= n; i++) {
            if ((a % i == 0) && (b % i == 0))
                gcd = i;
        }
        System.out.println(gcd);
    }
}
```

Activity 4 :

```
import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        int n = input.nextInt();
        double res = 0;
        for (int i = 1; i <= n; i++) {
            res += Math.pow(-1, i + 1) / (2 * i - 1);
        }
        res *= 4;
        System.out.println(res);
    }
}
```

Activity 5 :

```
import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        double n = input.nextInt(), m = 1, res = 1, idk;
        for (int i = 1; i <= n; i++) {
            for (int j = 1; j <= i; j++) {
                m *= j;
            }
            idk = 1 / m;
            res += idk;
            m = 1;
        }
        System.out.println(res);
    }
}
```


Activity 6 :

```
import java.util.Scanner;

public class Activity6 {
    public static void main(String[] args) {
        Scanner input= new Scanner(System.in);
        double n=input.nextDouble();
        int res=0;
        for (int i=2;i<n;i++) {
            for (int j=1;j<i;j++) {
                if (i%j==0) {
                    res+=j;
                }
            }
            if (res==i)
                System.out.println(i+" is perfect number");
            res=0;
        }
    }
}
```

Lab 4 : Methods

Activity 1 :

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        System.out.print("Please enter an integer:");
        Scanner input = new Scanner(System.in);
        long n = input.nextLong();
        System.out.println("The sum of its digits is " + sumDigits(n));
    }

    public static long sumDigits(long n) {
        long res = 0, rem;
        for (; n > 0; n /= 10) {
            rem = n % 10;
            res += rem;
        }
        return res;
    }
}
```

Activity 2 :

```
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {
        System.out.print("Please enter an integer:");
        Scanner input= new Scanner(System.in);
        long n= input.nextLong();
        reverse(n);
    }

    public static void reverse(long number) {
        long res=0;
        for (;number>0;number/=10) {
            long rem=number%10;
            res+=rem;
            res*=10;
        }
        res/=10;
        System.out.println("The reverse of the integer is "+res);
    }
}
```

Activity 3 :

```
import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        System.out.print("Please enter an integer:");
        Scanner input = new Scanner(System.in);
        int num = input.nextInt(), count = 0;
        for (int i = 2; i < num; i++)
            if (isPrime(i))
                count++;
        System.out.println("The number of prime numbers less than " + num + " is" +
            count);
    }

    public static boolean isPrime(int n) {
        for (int i = 2; i <= n / 2; i++) {
            if (n % i == 0)
                return false;
        }
        return true;
    }
}
```

Activity 4 :

```
import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        System.out.print("Enter the number of sides:");
        Scanner input = new Scanner(System.in);
        int n= input.nextInt();
        System.out.print("Enter the side:");
        double s= input.nextDouble();
        System.out.println("\t The area of the polygon is "+ area(n, s));
    }

    public static double area(int n, double s) {
        double area= (n*Math.pow(s, 2))/(4*Math.tan(Math.PI/n));
        return area;
    }
}
```

Activity 5 :

```
import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        System.out.print("Please enter a number between 0 anf 255:");
        Scanner input = new Scanner(System.in);
        int num = input.nextInt();
        System.out.println("\tThe corresponding binary value is "+ binary(num));
    }

    public static long binary(int n) {
        int res=0,i=0;
        while (n!=0) {
            int rem = n%2;
            res+=rem*Math.pow(10, i);
            n/=2;
            i++;
        }
        return res;
    }
}
```

Activity 5 (Even Better):

```
import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        System.out.print("Please enter a number between 0 anf 255:");
        Scanner input = new Scanner(System.in);
        int num = input.nextInt();
        System.out.println("\tThe corresponding binary value is "+ binary(num));
    }

    public static long binary(int n) {
        int res=0,i=0;
        while (n!=0) {
            int rem = n%2;
            res+=rem*Math.pow(10, i);
            n/=2;
            i++;
        }
        return res;
    }
}
```

Lab 5 : Recursion

Activity 1 :

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter an integer:");
        long num = input.nextLong();
        System.out.println("The factorial for the integer " + num + " is " +
        Factorial(num));
    }
    public static long Factorial(long num) {
        if (num == 0)
            return 1;
        return num * Factorial(num - 1);
    }
}
```

Activity 2 :

```
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter tow numbers (m,n):");
        long m = input.nextLong();
        long n = input.nextLong();
        System.out.println("The greatest common divisor is "+ gcd(m, n));
    }

    public static long gcd(long m, long n) {
        if (m % n == 0)
            return n;
        return gcd(n, m % n);
    }
}
```

Activity 3 :

```
import java.util.Scanner;

public class Activity3 {

    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter the value of i:");
        double i= input.nextDouble();
        count(i);
    }
}
```

```

    public static double m(double i) {
        if (i==1) return 1/i;
        return (1/i)+m(i=i-1);
    }

    public static void count(double i) {
        if (i!=0) {
            count(i-1);
            System.out.println("when i= "+ i + " the series= "+ m(i));
        }
    }
}

```

Activity 4 :

```

import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter a number:");
        int value = input.nextInt();
        reverseDisplay(value);
    }

    public static void reverseDisplay(int value) {

        if (value<=9) {
            System.out.print(value);
            return;
        }

        System.out.print(value%10);
        reverseDisplay(value/10);
    }
}

```

Activity 5 :

```

import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Please enter a number: ");
        int n = input.nextInt();
        System.out.println("The sum of its digits is "+ sumDigits(n));
    }

    public static int sumDigits(int n) {
        if (n/10==0) return n;
        return (n%10)+sumDigits(n/10);
    }
}

```

Lab 6 : Objects and Classes Part(I)

Activity 1 :

```
class Rectangle {  
  
    double width , hight = 1.0;  
  
    Rectangle() {  
        // TODO Auto-generated constructor stub  
    }  
  
    Rectangle(double newWidth, double newHight) {  
        width = newWidth;  
        hight = newHight;  
    }  
  
    double getArea() {  
        return hight * width;  
    }  
  
    double getParimeter() {  
        return (2 * hight) + (2 * width);  
    }  
}  
  
public class Activity1 {  
  
    public static void main(String[] args) {  
        Rectangle r1 = new Rectangle(4, 40);  
        Rectangle r2 = new Rectangle(3.5, 35.9);  
  
        System.out.println("For the first rectangle :");  
        System.out.println("The width = "+ r1.width+ "\nThe hight = "+r1.hight);  
        System.out.println("The Area = "+r1.getArea());  
        System.out.println("The Parimeter = "+r1.getParimeter()+"\n");  
        System.out.println("For the second rectangle :");  
        System.out.println("The width = "+ r2.width+ "\nThe hight = "+r2.hight);  
        System.out.println("The Area = "+r2.getArea());  
        System.out.println("The Parimeter = "+r2.getParimeter()+"\n");  
    }  
}
```

Activity 2 :

```
class Fan {
    int speed;
    boolean on;
    double radius = 5;
    String color = "blue";

    Fan() {

    }

    public String toString() {
        if (on == true){
            return "The speed is " + speed + "\nThe color is " + color + "\nThe
            radius is " + radius;
        }
        else {
            return "The color is " + color + "\nThe radius is " + radius + "\nFan is
            off";
        }
    }
}

public class Activity2 {
    public static void main(String[] args) {
        Fan f1 = new Fan();
        Fan f2 = new Fan();
        f1.speed = 100;
        f1.radius = 10;
        f1.color = "yellow";
        f1.on = true;
        f2.speed = 50;
        f2.radius = 5;
        f2.color = "blue";

        System.out.println("For the first Fan:" + f1.toString());
        System.out.println("For the second Fan:" + f2.toString());
    }
}
```


Activity 3 :

```
class RegularPolygon {
    int n = 5;
    double side = 2.0, x = 10.0, y = 10.0;

    RegularPolygon() {
    }

    RegularPolygon(int newN, double newSide) {
        n = newN;
        side = newSide;
    }

    RegularPolygon(int newN, double newSide, double newX, double newY) {
        n = newN;
        side = newSide;
        x = newX;
        y = newY;
    }

    double getPerimeter() {
        return n * side;
    }

    double getArea() {
        return (n * Math.pow(side, 2)) / (4 * Math.tan((Math.PI) / n));
    }
}

public class Activity3 {
    public static void main(String[] args) {
        RegularPolygon r1 = new RegularPolygon();
        RegularPolygon r2 = new RegularPolygon(4, 3);
        RegularPolygon r3 = new RegularPolygon(6, 4.5, 0, 0);

        System.out.println("For the first Polygon: The Area = "+r1.getArea()+ " and The
Perimeter = "+r1.getPerimeter());
        System.out.println("For the second Polygon: The Area = "+r2.getArea()+ " and
The Perimeter = "+r2.getPerimeter());
        System.out.println("For the third Polygon: The Area = "+r3.getArea()+ " and The
Perimeter = "+r3.getPerimeter());
    }
}
```

Lab 7 : Objects and Classes Part(II)

Activity 1 :

```
import java.util.Date;

public class Activity1 {
    public static void main(String[] args) {
        for (long i = 10000L; i < 10000000000000L ; i = i*10) {
            Date d = new Date(i);
            System.out.println(d.toString());
        }
    }
}
```

Activity 2 :

```
import java.util.Random;

public class Activity2 {
    public static void main(String[] args) {
        for (int i = 0; i < 50; i++) {
            Random r = new Random();
            System.out.println(r.nextInt(100)-50);
        }
    }
}
```

Activity 3 :

```
import java.util.Date;

public class Stopwatch {
    private long startTime , endTime;

    public long getStartTime () {
        return startTime;
    }
    public long getEndTime () {
        return endTime;
    }

    public Stopwatch() {
        Date d = new Date();
        startTime = d.getTime();
        endTime = d.getTime();
    }

    void start() {
        Date startT = new Date();
        startTime = startT.getTime();
    }

    void stop() {
```

```

        Date endT = new Date();

        endTime = endT.getTime();
    }

    long getElapsedTime() {
        return endTime - startTime;
    }
}

public class Activity3 {
    public static void main(String[] args) {
        Stopwatch s = new Stopwatch();
        for (int i = 0; i < 100000; i++) {
            Math.random();
        }
        s.stop();
        System.out.println(s.getElapsedTime());
    }
}

```

Activity 4 :

```

import java.util.Date;

public class Account {
    private int id;
    private double balance;
    private static double annualInterestRate;
    private Date dataCreated = new Date();

    public Account() {
        // TODO Auto-generated constructor stub
    }

    public Account(int newId , double newBalance) {
        id = newId;
        balance = newBalance;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public double getBalance() {
        return balance;
    }
}

```

```

    public void setBalance(double balance) {
        this.balance = balance;
    }

    public static double getAnnualInterestRate() {
        return annualInterestRate;
    }

    public static void setAnnualInterestRate(double annualInterestRate) {
        Account.annualInterestRate = annualInterestRate;
    }

    public Date getDataCreated() {
        return dataCreated;
    }

    double getMounthlyInterestRate() {
        return annualInterestRate / 12;
    }

    double getMounthlyInterest() {
        return balance * getMounthlyInterestRate();
    }

    void withdraw(double money) {
        balance = - money;
    }

    void deposit(double money) {
        balance = + money;
    }

}

public class Activity4 {
    public static void main(String[] args) {
        Account a1 = new Account(1122 , 20000);
        Account.setAnnualInterestRate(4.5);
        a1.withdraw(2500);
        a1.deposit(3000);
        System.out.println("The balance is : "+ a1.getBalance());
        System.out.println("The mounthly interest is : "+ a1.getMounthlyInterest());
        System.out.println("The Date when the account was created:" + a1.getDataCreated());
    }
}

```

Lab 8 : Single-Dimensional Arrays

Activity 1 :

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        int [] matrix = new int[10];

        for (int i = 0; i < matrix.length; i++) {
            System.out.print("Please enter an integer:");
            matrix[i] = input.nextInt();
        }

        for (int i = matrix.length - 1; i >=0; i--) {
            System.out.println(matrix[i]);
        }
    }
}
```

Activity 2 :

```
public class Activity2 {
    public static void main(String[] args) {
        int [] n = new int [100];
        for (int i = 0; i < n.length; i++)
            n[i] = (int)(Math.random()*10);

        for (int i : n)
            System.out.print(n[i]+" ");

        int [] counts = new int [10];

        for (int i = 0; i < n.length; i++)
            counts[n[i]]++;

        for (int i = 0; i < counts.length; i++)
            System.out.println("The count of "+i +" is "+counts[i]);
    }
}
```

Activity 3 :

```
import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        System.out.println("Please enter 10 number:");
        Scanner input = new Scanner(System.in);
        double [] n = new double[10];
    }
}
```

```

        for (int i = 0; i < n.length; i++)
            n[i] = input.nextInt();
        System.out.println("The minimum value of the numbers is "+min(n));
    }

    public static double min(double[] array) {
        double min = array[0];
        for (int i = 1; i < array.length; i++)
            if (array[i]<min)
                min = array[i];
        return min;
    }
}

```

Activity 4 :

```

import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        int[] list = new int[5];
        Scanner input = new Scanner(System.in);
        for (int i = 0; i < list.length; i++) {
            System.out.print("Please enter an integer: ");
            list[i] = input.nextInt();
        }

        for (int i : eliminateDuplicates(list))
            System.out.print(i + " ");
    }

    public static int searchMe (int [] list , int target, int size) {
        for (int i = 0; i < size; i++)
            if(list[i] == target)
                return i ;
        return -1;
    }

    public static int[] eliminateDuplicates(int[] list) {
        int count = 0;
        int[] temp = new int[list.length];

        for (int i = 0; i < list.length - 1; i++)
            for (int j = i + 1; j < list.length; j++)
                if (list[i] == list[j]) {
                    count++;
                    break;
                }
        }

        int size = list.length - count;
        int j=0;
        for (int i = 0; i < temp.length; i++)
            if(searchMe(temp, list[i], size) == -1) {

```

```

        temp[j] = list[i];
        j++;
    }

    int[] eD = new int[size];

    for (int i = 0; i < size; i++)
        eD[i] = temp[i];
    return eD;
}
}

```

Activity 5 :

```

import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter list1 size:");
        int size1 = input.nextInt();
        int[] list1 = new int[size1];
        System.out.print("Enter list1 contains:");
        for (int i = 0; i < list1.length; i++) {
            list1[i] = input.nextInt();
        }
        System.out.print("Enter list2 size:");
        int size2 = input.nextInt();
        int[] list2 = new int[size2];
        System.out.print("Enter list2 contains:");
        for (int i = 0; i < list2.length; i++) {
            list2[i] = input.nextInt();
        }
        if(size1 != size2) {
            System.out.println("Two lists are not strictly identical!");
        }
        else {
            if (equals(list1, list2))
                System.out.println("Two lists are strictly identical!");
            else
                System.out.println("Two lists are not strictly identical!");
        }
    }

    public static boolean equals(int[] list1 , int [] list2) {
        for (int i = 0; i < list2.length; i++) {
            if(list1[i] != list2[i])
                return false;
        }
        return true;
    }
}

```

Activity 6 :

```
import java.util.Scanner;

public class Activity6 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        int[] array1 = { 6, 7, 9 };
        int[] array2 = { 1, 2, 6, 14 };

        for (int i : merge(array1, array2))
            System.out.print(i + " ");
    }

    public static int[] merge(int[] list1, int[] list2) {
        int[] merged = new int[list1.length + list2.length];
        int i = 0, j = 0, k = 0;
        while (i < list1.length && j < list2.length) {
            if (list1[i] <= list2[j]) {
                merged[k] = list1[i];
                i++;
                k++;
            }
            else {
                merged[k] = list2[j];
                j++;
                k++;
            }
        }

        if(i==list1.length) {
            System.arraycopy(list2, j, merged, k, merged.length - k);
            return merged;
        }
        else if(j==list2.length) {
            System.arraycopy(list1, i, merged, k, merged.length - k);
            return merged;
        }
        return merged;
    }
}
```


Lab 9 : Multidimensional Arrays

Activity 1 :

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        double[][] matrix = new double[3][3];
        System.out.println("Enter a 3-by-3 matrix row by row:");
        for (int i = 0; i < matrix.length; i++)
            for (int j = 0; j < matrix[0].length; j++)
                matrix[i][j] = input.nextInt();

        for (int i = 0; i < matrix[0].length; i++)
            System.out.println("Sum of the elements at column " +i+ " is:
"+sumColumns(matrix, i));

        for (int i = 0; i < matrix.length; i++)
            System.out.println("Sum of the elements at row " +i+ " is:
"+sumRows(matrix, i));
    }

    public static double sumColumns(double [][] m , int columnIndex) {
        double sum = 0;
        for (int i = 0; i < m.length; i++)
            sum += m[i][columnIndex];
        return sum ;
    }

    public static double sumRows(double [][] m , int rowIndex) {
        double sum = 0;
        for (int i = 0; i < m[0].length; i++)
            sum += m[rowIndex][i];
        return sum ;
    }
}
```

Activity 2 :

```
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Enter the first 3-by-3 matrix row by row:");
        double [][] matrix1 = new double[3][3];
        for (int i = 0; i < matrix1.length; i++)
            for (int j = 0; j < matrix1[0].length; j++)
                matrix1[i][j] = input.nextDouble();

        System.out.println("Enter the second 3-by-3 matrix row by row:");
```

```

    double [][] matrix2 = new double[3][3];
    for (int i = 0; i < matrix2.length; i++)
        for (int j = 0; j < matrix2[0].length; j++)
            matrix2[i][j] = input.nextDouble();

    double [][] res = addMatrix(matrix1, matrix2);

    for (int i = 0; i < res.length; i++) {
        for (int j = 0; j < res[0].length; j++)
            System.out.print(res[i][j]+" ");
        System.out.println();
    }
    System.out.println();
    double [][] multi = multiMatrix(matrix1, matrix2);

    for (int i = 0; i < multi.length; i++) {
        for (int j = 0; j < multi[0].length; j++)
            System.out.print(multi[i][j]+" ");
        System.out.println();
    }
}

public static double [][] addMatrix(double [][] a , double [][] b){
    double [][] sum = new double [a.length][a[0].length];
    for (int i = 0; i < sum.length; i++)
        for (int j = 0; j < sum[0].length; j++)
            sum[i][j] = (a[i][j] + b[i][j]);
    return sum;
}

public static double [][] multiMatrix(double [][] a , double [][] b){
    double [][] multi = new double [a.length][a[0].length];
    double sum = 0;
    int k = 0;
    for (int i = 0; i < multi.length; i++) {
        sum = 0;
        for (int j = 0; j < multi.length; j++)
            sum += a[i][j] * b[j][i];
        multi[i][k] = sum;
        k++;
    }
    return multi;
}
}

```

Activity 3 :

```
public class Activity3 {
    public static void main(String[] args) {
        int[][] matrix = new int[4][4];
        for (int i = 0; i < matrix.length; i++)
            for (int j = 0; j < matrix[0].length; j++)
                matrix[i][j] = (int) (Math.random() * 2);

        for (int i = 0; i < matrix.length; i++) {
            for (int j = 0; j < matrix[0].length; j++)
                System.out.print(matrix[i][j] + " ");
            System.out.println();
        }

        int temp = 0 , largeR = 0;
        for (int i = 0; i < matrix.length; i++) {
            int countOne = 0;
            for (int j = 0; j < matrix[0].length; j++) {
                if (matrix[i][j] == 1)
                    countOne++;
            }
            if (countOne > temp) {
                largeR = i;
                temp = countOne;
            }
        }
        System.out.println("The largest row index: "+ largeR);

        int temp2 = 0 , largeC = 0;
        for (int i = 0; i < matrix.length; i++) {
            int countOne = 0;
            for (int j = 0; j < matrix[0].length; j++) {
                if (matrix[j][i] == 1)
                    countOne++;
            }
            if (countOne > temp2) {
                largeC = i;
                temp2 = countOne;
            }
        }
        System.out.println("The largest column index: "+ largeC);
    }
}
```

Activity 4 :

```
public class LinearEquation {
    private double[][] data = new double[2][3];

    LinearEquation(double[][] data) {
        this.data = data;
    }

    boolean isSolvable() {
        if ((data[0][0] * data[1][1] - data[0][1] * data[1][0]) != 0)
            return true;
        return false;
    }

    double getX() {
        return (data[0][2] * data[1][1] - data[0][1] * data[1][2]) / (data[0][0] * data[1][1] - data[0][1] * data[1][0]);
    }

    double getY() {
        return (data[0][0] * data[1][2] - data[0][2] * data[1][0]) / (data[0][0] * data[1][1] - data[0][1] * data[1][0]);
    }
}

import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        double [][] equation = new double[2][3];
        System.out.println("Enter the first two equations: (ax+y = e),(cx+dy = f)");
        for (int i = 0; i < equation.length; i++)
            for (int j = 0; j < equation[0].length; j++)
                equation[i][j] = input.nextDouble();

        LinearEquation l1 = new LinearEquation(equation);
        System.out.println("For the first two equations:");
        System.out.println((l1.isSolvable()) ? "x = "+l1.getX() : "The equation has no solution.");
        System.out.println((l1.isSolvable()) ? "y = "+l1.getY() : "The equation has no solution.");

        System.out.println("Enter the second two equations: (ax+y = e),(cx+dy = f)");
        for (int i = 0; i < equation.length; i++)
            for (int j = 0; j < equation[0].length; j++)
                equation[i][j] = input.nextDouble();

        LinearEquation l2 = new LinearEquation(equation);
        System.out.println("For the second two equations:");
        System.out.println((l2.isSolvable()) ? "x = "+l2.getX() : "The equation has no solution.");
        System.out.println((l2.isSolvable()) ? "y = "+l2.getY() : "The equation has no solution.");
    }
}
```

Lab 10 : Strings

Activity 1 :

```
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Enter the first String:");
        String first = input.nextLine();
        System.out.println("Enter the second String:");
        String second = input.nextLine();
        System.out.println((first.indexOf(second) != -1) ? "The second string is a
substring of the one" : "The second string is not a substring of the one");

        //another solution
        System.out.println((first.contains(second)) ? "The second string is a substring
of the one" : "The second string is not a substring of the one");
    }
}
```

Activity 2 :

```
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {

        Scanner input = new Scanner(System.in);
        System.out.println("Enter the cities:");
        String [] cities = new String[3];

        for (int i = 0; i < cities.length; i++)
            cities[i] = input.nextLine();

        String min = cities[0];
        for (int i = 0; i < cities.length; i++) {
            int k = i;
            for (int j = i+1 ; j < cities.length; j++) {
                if (cities[i].compareToIgnoreCase(cities[j]) > 0) {
                    min = cities[j];
                    k = j;
                }
            }
            String temp = cities[i];
            cities[i] = min;
            cities[k] = temp;
        }
        for (String string : cities)
            System.out.println(string);
    }
}
```

Activity 3 :

```
import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        System.out.println("Enter a binary number:");
        Scanner input = new Scanner(System.in);
        String binary = input.nextLine();
        int dec = 0 , j = 0 , value;

        for (int i = binary.length() - 1; i >= 0 ; i--) {
            value = (binary.charAt(i) == '1') ? 1 : 0;
            dec += value* Math.pow(2.0, j);
            j++;
        }

        System.out.println("The decimal number of "+binary+" is "+ dec);
    }
}
```

Activity 4 :

```
public class MyString1 {
    private char[] chars;
    public MyString1(char[] chars) {
        this.chars = chars;
    }
    public char charAt(int index) {
        return chars[index];
    }

    public int length() {
        return chars.length;
    }

    public MyString1 substring(int begin , int end) {

        char[] sub = new char[(end+1) - begin];

        for (int i = begin , j = 0; i < end; i++ , j++) {
            sub[i] = chars[j];
        }

        MyString1 subString = new MyString1(sub);
        return subString;
    }

    public MyString1 toLower() {
        char[] toLower = new char[chars.length];
        for (int i = 0; i < toLower.length; i++) {
            toLower[i] = Character.toLowerCase(chars[i]);
        }
    }
}
```

```

        return new MyString1(toLower);
    }

    public boolean equals (MyString1 s) {
        for (int i = 0 ; i < chars.length; i++)
            if (chars[i] != s.charAt(i))
                return false;
        return true;
    }

    public static MyString1 valueOf(int i) {
        int j = i , count = 0;
        while (j != 0) {
            j = j/10;
            count++;
        }
        char[] c = new char[count];
        for (int k = 0; k < c.length; k++) {
            c[k] = (char)(i%10 + 48);
        }
        return new MyString1(c);
    }
}

```

Activity 5 :

```

public class MyStringBulider1 {
    private String string;

    public MyStringBulider1(String string) {
        this.string = string;
    }

    public int length() {
        return string.length();
    }

    public char charAt(int index) {
        return string.charAt(index);
    }

    public String toString() {
        return string;
    }

    public MyStringBulider1 append(MyStringBulider1 s) {
        string += s.string;
        return new MyStringBulider1(string);
    }

    public MyStringBulider1 append(int i) {
        string += i + "";
        return new MyStringBulider1(string);
    }
}

```

```
public MyStringBulider1 toLowerCase() {  
    string = string.toLowerCase();  
    return new MyStringBulider1(string);  
}  
  
public MyStringBulider1 substring(int begin , int end) {  
    string = string.substring(begin, end);  
    return new MyStringBulider1(string);  
}  
}
```


Lab 11 : Introduction to Exception Handling and Text I/O

Activity 1 :

```
import java.util.Random;
import java.util.Scanner;

public class Activity1 {
    public static void main(String[] args) {
        int [] array = new int[100];
        Random r = new Random();
        for (int i = 0; i < array.length; i++)
            array[i] = r.nextInt();

        try {
            Scanner input = new Scanner(System.in);
            System.out.print("Please enter the index of the value you want to get: ");
            int i = input.nextInt();
            if (i >= 0 && i < array.length)
                System.out.println("The value of Index "+i+" is "+ array[i]);
            else
                throw new IndexOutOfBoundsException("Out of Bounds");
        } catch (Exception e) {
            System.out.println(e.getMessage());
        }
    }
}
```

Activity 2 :

```
import java.io.File;
import java.io.IOException;
import java.io.PrintWriter;
import java.util.Scanner;

public class Activity2 {
    public static void main(String[] args) {
        File f = new File("Count");
        if (f.exists())
            try {
                Scanner s = new Scanner(f);
                int charCount = 0 , wordsCount = 0 , linesCount = 0;
                while (s.hasNext()) {
                    String [] words = s.nextLine().split(" ");
                    wordsCount += words.length;
                    for (int j = 0; j < words.length ; j++) {
                        charCount += words[j].length();
                    }
                    linesCount++;
                }
                System.out.println("The number of characters is : "+charCount);
                System.out.println("The number of words is : "+wordsCount);
                System.out.println("The number of lines is : "+linesCount);
            }
    }
}
```

```

        }catch(IOException e) {
            System.out.println(e);
        }
    }
    else
        System.out.println("Oh nooooo!! The file is not exists!");
}
}

```

```

*Count × Activity2.java *MyStringBulide
1 I like java
2 I like COMP1331!!!
3 Cafeteria Al-3looom is the BEST! |

```

Activity 3 :

```

import java.io.File;
import java.io.IOException;
import java.io.PrintWriter;
import java.util.Scanner;

public class Activity3 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Please Enter File's name : ");
        String file = input.next();
        File f = new File(file);
        if (f.exists()) {
            try {
                Scanner fileScanner = new Scanner(f);
                double sum = 0 , count = 0;
                while (fileScanner.hasNext()) {
                    sum += fileScanner.nextInt();
                    count++;
                }
                System.out.println("The sum of all grades is : "+sum);
                System.out.println("The average of all grades is : "+(sum/count));
            } catch (IOException e) {
                System.out.println(e);
            }
        }
        else
            System.out.println("ohhhh noooo!!! File is not found :(");
    }
}

```

```

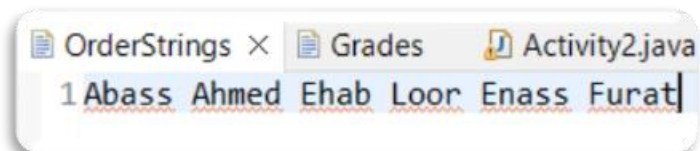
Grades × Activity2.java
188 55 94 99 100 75|

```

Activity 4 :

```
import java.io.*;
import java.util.Scanner;

public class Activity4 {
    public static void main(String[] args) {
        File f = new File("OrderStrings");
        if (f.exists()) {
            try {
                Scanner s = new Scanner(f);
                String prev , curr;
                while (s.hasNext()) {
                    prev = s.next();
                    curr = s.next();
                    if (prev.compareTo(curr) > 0) {
                        System.out.println(prev);
                        System.out.println(curr);
                        break;
                    }
                    prev = curr;
                    curr = s.next();
                }
            } catch (IOException e) {
                System.out.println("IO error!!!");
            }
        } else
            System.out.println("Ohhhh Nooooo !! File is not found !!!");
    }
}
```

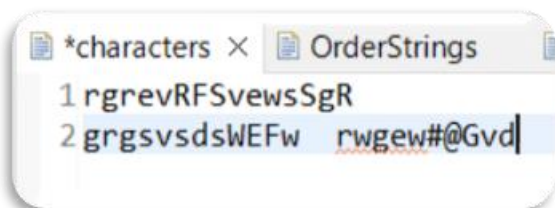


Activity 5 :

```
import java.io.*;
import java.util.Scanner;

public class Activity5 {
    public static void main(String[] args) {
        File f = new File("characters");
        int [] letterCount = new int [26];
        if (f.exists()) {
            try {
                Scanner read = new Scanner(f);
                while (read.hasNext()) {
                    String letters = read.next();
                    for (int i = 0; i < letters.length(); i++) {
                        char c = letters.charAt(i);
                        if (Character.isLetter(c)) {
                            c = Character.toLowerCase(c);
                            int index = (int)c - 97;
                            letterCount[index]++;
                        }
                    }
                }
            } catch (IOException e) {
                System.out.println(e);
            }

            for (int i = 0; i < letterCount.length; i++) {
                System.out.println("The count of letter " + (char)(i+97) + " \\ " +
                    (char)(i+65) + " is : " + letterCount[i]);
            }
        } else
            System.out.println("Error : file is not found!!");
    }
}
```



```
System.out.println("The End !");
```