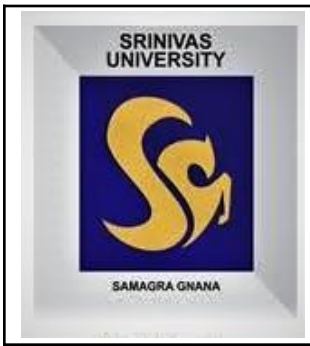

SRINIVAS UNIVERSITY
INSTITUTE OF ENGINEERING AND TECHNOLOGY
MUKKA, MANGALURU

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LAB MANUAL

OBJECT ORIENTED PROGRAMMING USING JAVA LAB
SUBJECT CODE: 23SCS033

COMPILED BY:

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1. **Write a Java program that display the roots of a quadratic equation ax2+bx+c=0. Calculate the discriminate D and based on value of D, describe the nature of root.**

```
public class Main
{

  public static void main(String[] args)
{
    // value a, b, and c
    double a = 2.3, b = 4, c = 5.6;
    double root1, root2;

    // calculate the determinant (b2 - 4ac)
    double determinant = b * b - 4 * a * c;

    // check if determinant is greater than 0
    if (determinant > 0) {

      // two real and distinct roots
      root1 = (-b + Math.sqrt(determinant)) / (2 * a);
      root2 = (-b - Math.sqrt(determinant)) / (2 * a);

      System.out.format("root1 = %.2f and root2 = %.2f", root1, root2);
    }
    // check if determinant is equal to 0
    else if (determinant == 0) {
```

```
      // two real and equal roots
      // determinant is equal to 0
      // so -b + 0 == -b
      root1 = root2 = -b / (2 * a);
      System.out.format("root1 = root2 = %.2f;", root1);
    }

    // if determinant is less than zero
    else
{
      // roots are complex number and distinct
      double real = -b / (2 * a);
      double imaginary = Math.sqrt(-determinant) / (2 * a);
      System.out.format("root1 = %.2f+%.2fi", real, imaginary);
      System.out.format("\nroot2 = %.2f-%.2fi", real, imaginary);
    }
  }
}
```

Output:

```
root1 = -0.87+1.30i and root2 = -0.87-1.30i
```

2 a. Write a Java program that works as a simple calculator.

```
import java.util.Scanner;

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

    char operator;
    Double number1, number2, result;

    // create an object of Scanner class
    Scanner input = new Scanner(System.in);

    // ask users to enter operator
    System.out.println("Choose an operator: +, -, *, or /");
    operator = input.next().charAt(0);

    // ask users to enter numbers
    System.out.println("Enter first number");
    number1 = input.nextDouble();

    System.out.println("Enter second number");
    number2 = input.nextDouble();

    switch (operator) {

      // performs addition between numbers
      case '+':
        result = number1 + number2;
        System.out.println(number1 + " + " + number2 + " = " + result);
        break;

      // performs subtraction between numbers
      case '-':
        result = number1 - number2;
        System.out.println(number1 + " - " + number2 + " = " + result);
        break;

      // performs multiplication between numbers
      case '*':
        result = number1 * number2;
        System.out.println(number1 + " * " + number2 + " = " + result);
        break;

      // performs division between numbers
```

```
    case '/':
      result = number1 / number2;
      System.out.println(number1 + " / " + number2 + " = " + result);
      break;

    default:
      System.out.println("Invalid operator!");
      break;
  }

  input.close();
 }
}
```

Output:

```
Choose an operator: +, -, *, or /
*
Enter first number
3
Enter second number
9
3.0 * 9.0 = 27.
```

b. Write a Java program to sort for an element in a given list of elements using bubble sort.

1. **public class** BubbleSortExample {

```
2.      static void bubbleSort(int[] arr) {
3.          int n = arr.length;
4.          int temp = 0;
5.           for(int i=0; i < n; i++){
6.                   for(int j=1; j < (n-i); j++){
7.                           if(arr[j-1] > arr[j]){
8.                                   //swap elements
9.                                   temp = arr[j-1];
10.                                  arr[j-1] = arr[j];
11.                                  arr[j] = temp;
12.                          }
13.
14.                  }
15.          }
16.
17.     }
18.     public static void main(String[] args) {
19.             int arr[] ={3,60,35,2,45,320,5};
20.
21.             System.out.println("Array Before Bubble Sort");
22.             for(int i=0; i < arr.length; i++){
23.                     System.out.print(arr[i] + " ");
24.             }
25.             System.out.println();
26.
27.             bubbleSort(arr);//sorting array elements using bubble sort
28.
29.             System.out.println("Array After Bubble Sort");
30.             for(int i=0; i < arr.length; i++){
31.                     System.out.print(arr[i] + " ");
32.             }
33.
34.     }
35. }
```

Output:

```
Array Before Bubble Sort
3 60 35 2 45 320 5
Array After Bubble Sort
2 3 5 35 45 60 320
```

3. Create a Java class called Student with the following details as variables within it.
(i) USN
(ii) Name
(iii) Branch
(iv) Phone
Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.

```
 import java.util.Scanner;

public class student

 {
String USN;
String Name;
String branch;
int phone;
void insertRecord(String reg,String name, String brnch,int ph) {

USN=reg;
Name=name;
branch=brnch;
phone=ph;
}

void displayRecord()
{
System.out.println(USN+" "+Name+" "+branch+" "+phone);
}

public static void main(String args[])
{
student s[]=new student [100];
Scanner sc=new Scanner(System.in);
System.out.println("enter the number of students");
int n=sc.nextInt();
for(int i=0;i<n;i++)
     s[i]=new student();
for(int j=0;j<n;j++)
{       System.out.println("enter the usn,name,branch,phone")
        String USN=sc.next();
        String Name=sc.next();
       String branch=sc.next();
        int phone=sc.nextInt();
   s[j].insertRecord(USN,Name,branch,phone);

}
```

```
for( int m=0;m<n;m++)
{
  s[m].displayRecord();
        }

        }
        }
```

OUTPUT:

```
enter the number of students
2
enter the usn,name,branch,phone
1
monika
cse
93411
enter the usn,name,branch,phone
12
gowda
cse 9785
students details are
 1 monika cse 93411
12 gowda cse 9785
```

4 a. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation

```
 import java.lang.*;
```

```
class add
{
void display(int a,int b)
{
int c=a+b;
System.out.println("The sum of " + a + " & " + b + " is " + c);
}
void display(double a,double b)
{ double c=a+b;
System.out.println("The sum of " + a + " & " + b + " is " + c);

}
}
class add_demo
{
public static void main(String arg[])
{
add obj=new add();
obj.display(10,20);
obj.display(10.2,20.2);
}
}
```

Output:
The sum of 10 & 20 is 30
The sum of 10.2 & 20.2 is 30.4

b. Write a java program for abstract class to find areas of different shapes

```
abstract class shape

{
```

```
abstract double area();

}

class rectangle extends shape

{

double l=12.5,b=2.5;

double area()

{

return l*b;

}

}

class triangle extends shape

{

double b=4.2,h=6.5;

double area()

{

return 0.5*b*h;

}

}

class square extends shape

{
```

```
double s=6.5;
double area()
{
return 4*s;
}
}
class shapedemo
{
public static void main(String[] args)
{
rectangle r1=new rectangle();
triangle t1=new triangle();
square s1=new square();
System.out.println("The area of rectangle is: "+r1.area());
System.out.println("The area of triangle is: "+t1.area());
System.out.println("The area of square is: "+s1.area());
}
}
```

Output:

```
The area of rectangle is: 31.25
```

The area of triangle is: 13.65

The area of square is: 26.0

5. Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.

```
class Staff {
int staffid,phone,salary;
String name;
public Staff(int id , int no, int sal, String na){
staffid=id;
phone=no;
salary=sal;
name=na;
}
void display(){
System.out.println("-------------------------------------");
System.out.println("Staff ID:"+ " "+ staffid);
System.out.println("Staff Phone number:" + " "+ phone);
System.out.println("Staff Salary:" +" "+ salary);
System.out.println("Staff Name:" +" "+ name);
}
}
class Teaching extends Staff {
String domain;
int no_of_publications;
public Teaching(int id, int no, int sal, String na,String d,int nop){
super(id,no,sal,na);
domain=d;
no_of_publications=nop;
}
void Tdisplay(){
System.out.println("-------------------------------------");
System.out.println("Teaching Staff Details");
super.display();
System.out.println("Domain :" +" "+domain);
System.out.println("No_of_publications:"+" "+no_of_publications);
}
}
class Technical extends Staff{
String skills;
public Technical(int id , int no, int sal, String na,String sk){
super(id,no,sal,na);
skills=sk;
}
void Tedisplay(){
System.out.println("-------------------------------------");
System.out.println("Technical Staff Details");
super.display();
```

```
System.out.println("Skills :" + " "+skills);
}
}
class Contract extends Staff{
int period;
public Contract(int id , int no, int sal, String na,int pd){
super(id,no,sal,na);
period=pd;

}
void Cdisplay(){
System.out.println("-------------------------------------");
System.out.println("Contract Staff Details");
super.display();
System.out.println("ContractPeriod:" + " "+period + "years");
}
}
public class Multilevel{
public static void main(String args[]){
Teaching t1=new Teaching(11,998765434,31000,"Anil","CSE",10);
Teaching t2=new Teaching(12,996655546,30000,"Anu","ISE",9);
Teaching t3=new Teaching(13,999933442,32000,"Anusha","EEE",8);
t1.Tdisplay();
t2.Tdisplay();
t3.Tdisplay();
Technicalte1=new Technical(21,994433221,22000,"Kumar","C");
Technicalte2=new Technical(22,998877665,28000,"Krisna","Java");
Technical te3=new Technical(23,991654321,33000,"Kiran","Java");
te1.Tedisplay();
te2.Tedisplay();
te3.Tedisplay();
Contract ct1=new Contract(31,998765434,35000,"Anil",3);
Contract ct2=new Contract(32,912345678,39000,"Meghana",2);
Contract ct3=new Contract(33,992233445,30000,"Uma",4);
ct1.Cdisplay();
ct2.Cdisplay();
ct3.Cdisplay();
}
}
```

Output:

Output:

```
-------------------------------------
Teaching Staff Details
-------------------------------------
Staff ID: 11
Staff Phone number: 998765434
Staff Salary: 31000
Staff Name: Anil
Domain : CSE
No_of_publications: 10
-------------------------------------
Teaching Staff Details
-------------------------------------
Staff ID: 12
Staff Phone number: 996655546
Staff Salary: 30000
Staff Name: Anu
Domain : ISE
No_of_publications: 9
-------------------------------------
Teaching Staff Details
-------------------------------------
Staff ID: 13
Staff Phone number: 999933442
Staff Salary: 32000
Staff Name: Anusha
Domain : EEE
No_of_publications: 8

-------------------------------------
Technical Staff Details
-------------------------------------
Staff ID: 21
Staff Phone number: 994433221
Staff Salary: 22000
Staff Name: Kumar
Skills : C
-------------------------------------
Technical Staff Details
-------------------------------------
Staff ID: 22
Staff Phone number: 998877665
Staff Salary: 28000
Staff Name: Krisna
Skills : Java
```

Technical Staff Details

Staff ID: 23
Staff Phone number: 991654321
Staff Salary: 33000
Staff Name: Kiran
Skills : Java

Contract Staff Details

Staff ID: 31
Staff Phone number: 998765434
Staff Salary: 35000
Staff Name: Anil
ContractPeriod: 3years

Contract Staff Details

Staff ID: 32
Staff Phone number: 912345678
Staff Salary: 39000
Staff Name: Meghana
ContractPeriod: 2years

Contract Staff Details

Staff ID: 33
Staff Phone number: 992233445
Staff Salary: 30000
Staff Name: Uma
ContractPeriod: 4years

6. Write a Java class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display

```
import java.util.Scanner;
import java.util.StringTokenizer;
class customer
{
String name;
String date;
public void read()
{
Scanner input =new Scanner(System.in);
name=input.next();
```

```
date=input.next();
}
public void display()
{
System.out.print(name+",");
String delims="/";
StringTokenizer st=new StringTokenizer(date,delims);
while(st.hasMoreElements()){
System.out.print(st.nextElement()+",");
}
System.out.println();
}
public static void main(String[] args)
{
System.out.println("Enter the customer detail");
customer[] cus=new customer[30];
Scanner sc =new Scanner(System.in);

System.out.println("enter the number of customer");
int n=sc.nextInt();
for(int i=0;i<n;i++)< span="" style="box-sizing: border-box;">
{
cus[i]=new customer();
cus[i].read();
}
for(int i=0;i<n;i++)< span="" style="box-sizing: border-box;">
cus[i].display();
}
}</n;i++)<></n;i++)<>
```

Output:

```
Enter the customer detail
enter the number of customer
2
Enter the customer name and date
rama
12/2/2018
laxman
11/4/2018

rama,12,2,2018,
```

```
laxman,11,4,2018,
```

7. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

```
import java.io.*; import java.util.*;
class First extends Thread
{
public void run()
{
for(;;)
{
int r;
Random d = new Random(); roll = d.nextInt(200) + 1; System.out.println(r);
Thread t2=new Second(r); Thread t3=new Third(r); try
{
Thread.sleep(1000);
if(roll%2==0)
t2.start(); else t3.start();
}
```

```
catch(InterruptedException e){}
}
}
}
class Second extends Thread

{
int r1; Second(int r)
{
r1=r;
}
public void run()
{
System.out.println("The square of number"+r1+"is:"+r1*r1);
}
}
class Third extends Thread
{
int r1; Third(int r)
{
r1=r;
}
public void run()
{
System.out.println("The Cube of the Number"+r1+"is: "+r1*r1*r1);
}
}
classMthread
{
public static void main(String[] args)
{
Thread t1=new First(); System.out.println("press Ctrl+c to stop....."); t1.start();
}
}
```

8. Write a java program that displays the number of characters, lines and words in a text file.

```
import java.io.*;
class FileDemo
{
	public static void main(String args[])
	{
		try
		{
			int lines=0,chars=0,words=0;
			int code=0;
			FileInputStream fis = new FileInputStream("sample.txt");
			while(fis.available()!=0)
			{
				code = fis.read();
				if(code!=10)
```

```
                                chars++;
                                if(code==32)
                                words++;
                                if(code==13)
                                {
                                        lines++;
                                        words++;
                                }
                        }
                        System.out.println("No.of characters = "+chars);
                        System.out.println("No.of words = "+(words+1));
                        System.out.println("No.of lines = "+(lines+1));
                        fis.close();
                }
                catch(FileNotFoundException e)
                {
                        System.out.println("Cannot find the specified file...");
                }
                catch(IOException i)
                {
                        System.out.println("Cannot read file...");
                }
        }
}
```

Output:

Content in sample.txt file is:

He is
a good
boy

Input and output for the above program is as follows:

No.of characters = 16
No.of words = 5
No.of lines = 3

9. Write a java program that reads a file and displays the file on the screen with line number b.

```
import java.io.*;
public class ReadFile
{
public static void main(String[] args)
{
try
{
FileReader input = new FileReader(args[0]);
BufferedReader bufRead = new BufferedReader(input);
String line;
int count = 0;
line = bufRead.readLine();
count++;
while (line != null)
{
System.out.println(count+": "+line);
line = bufRead.readLine();
count++;
}
bufRead.close();
}
catch (ArrayIndexOutOfBoundsException e)
{
System.out.println("Usage: java ReadFile filename\n");
}
catch (IOException e)
{
e.printStackTrace();
}
}
}
```

Output:

10._Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

```
//import package to create simple calculator
import java.util.*;
import java.awt.*;
import java.awt.event.*;
import java.io.*;
class Week9 extends Frame implements ActionListener
{
	int i=0,temp=0;
	char a;
	float stk[];
	int top;
	TextField t;
	Button dot,mod,b,one,two,three,four,five,six,seven,eight,nine,
zero,add,sub,mul,div,eq,sine,sqrt,cbrt;
GridBagConstraints gc;
	Week9()
	{
		super("My Calculator");
		stk=new float[20];
		top=-1;
		gc=new GridBagConstraints(); //creating gridlayout
//creating textfield and button on simple calculator
		t=new TextField("");
		b=new Button("Reset");
		one=new Button(" 1 ");
		two=new Button(" 2 ");
		three=new Button(" 3 ");
		four=new Button(" 4 ");
		five=new Button(" 5 ");
		six=new Button(" 6 ");
		seven=new Button(" 7 ");
		eight=new Button(" 8 ");
		nine=new Button(" 9 ");
		zero=new Button(" 0 ");
		add=new Button(" + ");
```

```
sub=new Button(" - ");
mul=new Button(" * ");
div=new Button(" / ");
eq=new Button(" = ");
dot=new Button("...");
mod=new Button(" % ");
sine=new Button(" sin ");
sqrt=new Button(" sqrt ");
cbrt=new Button(" cbrt ");
setSize(250,250);
setLocation(500,200);
setLayout(new GridBagLayout());
addcomp(one,1,1,1,1);
addcomp(two,1,2,1,1);
addcomp(three,1,3,1,1);
addcomp(four,1,4,1,1);
addcomp(five,2,1,1,1);
addcomp(six,2,2,1,1);
addcomp(seven,2,3,1,1);
addcomp(eight,2,4,1,1);
addcomp(nine,3,1,1,1);
addcomp(zero,3,2,1,1);
addcomp(mul,3,3,1,1);
addcomp(div,3,4,1,1);
addcomp(add,4,1,1,1);
addcomp(sub,4,2,1,1);
addcomp(eq,4,3,1,1);
addcomp(mod,4,4,1,1);
addcomp(dot,5,1,1,1);
addcomp(sine,5,2,1,1);
addcomp(sqrt,5,3,1,1);
addcomp(cbrt,5,4,1,1);
addcomp(new Label(""),7,1,4,1);
addcomp(t,8,1,4,1);
addcomp(new Label(""),9,1,4,1);
addcomp(b,10,2,2,1);
setVisible(true);
one.addActionListener(this);
two.addActionListener(this);
three.addActionListener(this);
four.addActionListener(this);
five.addActionListener(this);
six.addActionListener(this);
seven.addActionListener(this);
eight.addActionListener(this);
nine.addActionListener(this);
```

```
                zero.addActionListener(this);
                mul.addActionListener(this);
                div.addActionListener(this);
                add.addActionListener(this);
                sub.addActionListener(this);
                eq.addActionListener(this);
                mod.addActionListener(this);
                dot.addActionListener(this);
                sine.addActionListener(this);
                sqrt.addActionListener(this);
                cbrt.addActionListener(this);
                b.addActionListener(this);
        }
        public void addcomp(Component cc,int r,int c,int w,int h)
        {
                gc.gridx=c;
                gc.gridy=r;
                gc.gridwidth=w;
                gc.gridheight=h;
                gc.fill=gc.BOTH;
                add(cc,gc);
        }
// performing action on simple calculator
        public void actionPerformed(ActionEvent ae)
        { // comparing input value in simple calculator
                if(ae.getSource()==b)
                {
                        t.setText("");
                }
                if(ae.getSource()==one)
                {
                        if(temp==1)
                        func();
                        t.setText(t.getText()+"1");
                }
                if(ae.getSource()==two)
                {
                        if(temp==1)
                        func();
                        t.setText(t.getText()+"2");
                }
                if(ae.getSource()==three)
                {
                        if(temp==1)
                        func();
                        t.setText(t.getText()+"3");
```

```
		}
		if(ae.getSource()==four)
		{
			if(temp==1)
			func();
			t.setText(t.getText()+"4");
		}
		if(ae.getSource()==five)
		{
			if(temp==1)
			func();
			t.setText(t.getText()+"5");
		}
		if(ae.getSource()==six)
		{
			if(temp==1)
			func();
			t.setText(t.getText()+"6");
		}
		if(ae.getSource()==seven)
		{
			if(temp==1)
			func();
			t.setText(t.getText()+"7");
		}
		if(ae.getSource()==eight)
		{
			if(temp==1)
			func();
			t.setText(t.getText()+"8");
		}
		if(ae.getSource()==nine)
		{
			t.setText(t.getText()+"9");
			if(temp==1)
			func();
		}
		if(ae.getSource()==zero)
		{
			t.setText(t.getText()+"0");
			if(temp==1)
			func();
		}
	if(ae.getSource()==add||ae.getSource()==sub||ae.getSource()==mul||
ae.getSource()==div||ae.getSource()==mod||ae.getSource()==sqrt||
ae.getSource()==cbrt||ae.getSource()==sine)
```

```
		{
			String s;
			s=t.getText();
			float num1=0,num2=0,num3=0;
			float n=Float.parseFloat(s);
			push(n);
			if(ae.getSource()==add)
			a='+';
			if(ae.getSource()==sub)
			a='-';
			if(ae.getSource()==mul)
			a='*';
			if(ae.getSource()==div)
			a='/';
			if(ae.getSource()==mod)
			a='%';
			t.setText("");
			if(ae.getSource()==sqrt)
			{
				double num=pop();
				t.setText(Double.toString(Math.sqrt(num)));
			}
			if(ae.getSource()==cbrt)
			{
				double num=pop();
				t.setText(Double.toString(Math.cbrt(num)));
			}
			if(ae.getSource()==sine)
			{
				double num=pop();
				t.setText(Double.toString(Math.sin(num)));
			}
		}
		if(ae.getSource()==eq)
		{
			float num1=0,num2=0,num3=0,temp1;
			String s=t.getText();
			float n=Float.parseFloat(s);
			push(n);
			num1=pop();
			num2=pop();
			switch(a)
			{
// perform arithmetic operation
				case '+' : num3=num1+num2;push(num3);break;
				case '-' : num3=num2-num1;push(num3);break;
```

```
                        case '*' : num3=num1*num2;push(num3);break;
                        case '/' : num3=num2/num1;push(num3);break;
                        case '%' : num3=num2%num1;push(num3);break;
                }
                if(i==1)
                {
                        t.setText(Float.toString(num3));
                        i=0;
                }
                else
                t.setText(Integer.toString((int)num3));
                temp=1;
        }
        if(ae.getSource()==dot)
        {
                i=1;
                t.setText(t.getText()+".");
        }
    }
    public void push(float a)
    {
        top++;
        stk[top]=a;
    }
    public float pop()
    {
        float num=stk[top];
        top--;
        return(num);
    }
    public void func()
    {
        t.setText("");
        temp=0;
    }
    public static void main(String rr[])throws Exception
    {
        new Week9();
    }
}
```