Object Oriented Java

Lab Report

BMSCE, Bangalore

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Section: 3 D

Year: 2020

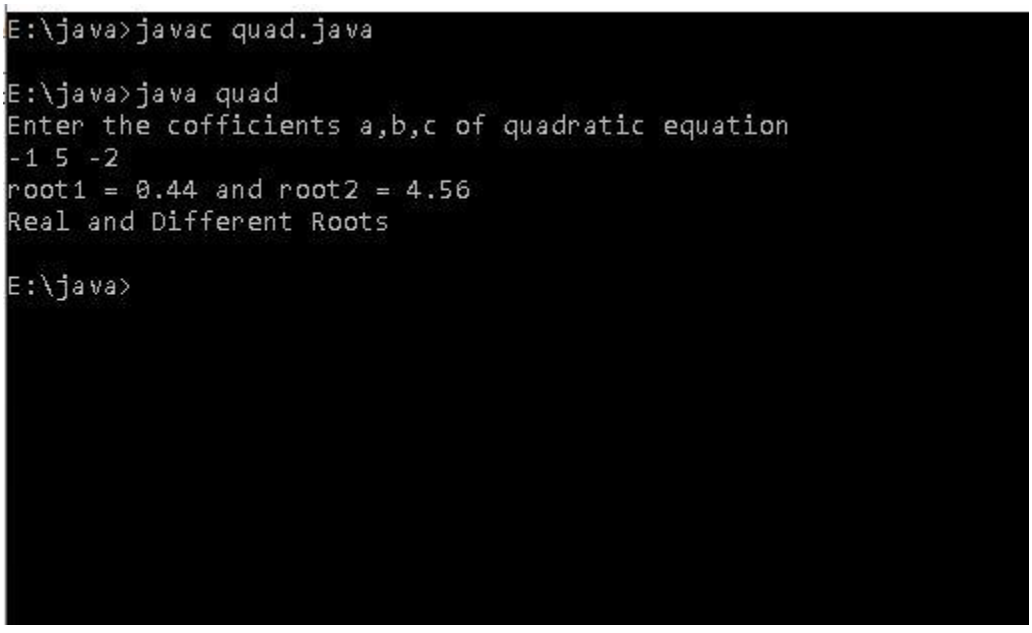
Java Lab Program 1

Code:

```
import java.util.Scanner;
public class quad {

   public static void main(String[] args) {
      System.out.println("Enter the cofficients a,b,c of quadratic equation");
      Scanner sc = new Scanner(System.in);
      double a=sc.nextInt();
      double b=sc.nextInt();
      double c=sc.nextInt();
      double root1, root2;

      double determinant = b * b - 4 * a * c;

      if(determinant > 0) {
         root1 = (-b + Math.sqrt(determinant)) / (2 * a);
         root2 = (-b - Math.sqrt(determinant)) / (2 * a);

         System.out.format("root1 = %.2f and root2 = %.2f", root1 , root2);
         System.out.println("\nReal and Different Roots");
      }
      // condition for real and equal roots
      else if(determinant == 0) {
         root1 = root2 = -b / (2 * a);
```

```
        System.out.format("root1 = root2 = %.2f;", root1);
        System.out.println("\nReal and Equal Roots");
    }
    else {
        double realPart = -b / (2 *a);
        double imaginaryPart = Math.sqrt(-determinant) / (2 * a);

        System.out.format("root1 = %.2f+%.2fi and root2 = %.2f-%.2fi", realPart, imaginaryPart, realPart, imaginaryPart);
        System.out.println("\nImaginary Roots");
    }
  }
}
```

Output:



Java Lab Program 2

Code:

```
import java.util.Scanner;

class Student {
   Scanner sc = new Scanner(System.in);
   String USN, Name;
   int credits[] = new int[5];
   float marks[] = new float[5];
   int points[] = new int[5];
   float SGPA;
   int totalCredits = 0;

   void input() {
      System.out.println("Enter Student's USN: ");
      USN = sc.nextLine();
      System.out.println("Enter Student's Name: ");
      Name = sc.nextLine();
      for (int i = 0; i < 5; i++) {
         System.out.println("Enter Credits for Subject " + (i + 1) + ": ");
         credits[i] = sc.nextInt();
         totalCredits += credits[i];
         System.out.println("Enter Marks for Subject " + (i + 1) + ": ");
         marks[i] = sc.nextFloat();
      }
   }
```

```
void gpa() {

   for (int i = 0; i < 5; i++) {
      if (marks[i] > 100) {
         System.out.println("Error: Marks are above 100");
         return;
      } else if (marks[i] >= 90) {
         points[i] = 10;
      } else if (marks[i] >= 80) {
         points[i] = 9;
      } else if (marks[i] >= 70) {
         points[i] = 8;
      } else if (marks[i] >= 60) {
         points[i] = 7;
      } else if (marks[i] >= 50) {
         points[i] = 5;
      } else if (marks[i] >= 40) {
         points[i] = 4;
      } else {
         points[i] = 0;
      }

      SGPA += (points[i] * credits[i]);
   }
}

void display() {
```

```
        System.out.println("Student's USN: " + USN);
        System.out.println("Student's Name: " + Name);
        for (int i = 0; i < 5; i++) {
            System.out.println("Subject " + (i + 1) + " - Credits: " + credits[i] + " - Marks: " + marks[i]);
        }
        System.out.println("SGPA of " + Name + " is: " + (float) (SGPA / totalCredits));
    }

}

class st {
    public static void main(String args[]) {
        Student s1 = new Student();
        s1.input();
        s1.gpa();
        s1.display();

    }
}
```

Output:

```
PS E:\java> javac student.java
PS E:\java> java st
Enter Student's USN:
1BM19CS211
Enter Student's Name:
Shashank
Enter Credits for Subject 1:
5
Enter Marks for Subject 1:
85
Enter Credits for Subject 2:
4
Enter Marks for Subject 2:
90
Enter Credits for Subject 3:
4
Enter Marks for Subject 3:
90
Enter Credits for Subject 4:
3
Enter Marks for Subject 4:
85
Enter Credits for Subject 5:
3
Enter Marks for Subject 5:
75
Student's USN: 1BM19CS211
Student's Name: Shashank
Subject 1 - Credits: 5 - Marks: 85.0
Subject 2 - Credits: 4 - Marks: 90.0
Subject 3 - Credits: 4 - Marks: 90.0
Subject 4 - Credits: 3 - Marks: 85.0
Subject 5 - Credits: 3 - Marks: 75.0
SGPA of Shashank is: 9.263158
PS E:\java>
```

Java Lab Program 3

Code:

```
import java.util.*;
import java.lang.*;
class Book {
	String name, author;
	double price;
	int num_pages;
	Scanner in = new Scanner(System.in);

	Book() {
		System.out.println("Enter name of book: ");
		name = in.nextLine();

		System.out.println("Enter name of author: ");
		author = in.nextLine();

		System.out.println("Enter price of book in Rs: ");
		price = in.nextDouble();

		System.out.println("Enter number of pages in the book: ");
		num_pages = in.nextInt();
	}

	void show() {
		System.out.println("Name: " + name);
		System.out.println("Author: " + author);
		System.out.println("Price: " + price);
```

```
        System.out.println("Number of pages: " + num_pages);
}

public String toString() {
        return name + ", By " + author + " for Rs." + price + " and has " + num_pages + " pages";
}

public static void main(String[] args) {

        Scanner in = new Scanner(System.in);

        int n, x;

        System.out.println("Enter number of books to be created: ");
        n = in.nextInt();

        Book B[] = new Book[n];

        for(int i = 0; i < n; i++) {
                System.out.println("Book " + (i+1));
                B[i] = new Book();
                System.out.println();
        }

        for(int i = 0; i < n; i++) {
                System.out.println("Book " + (i+1));
                System.out.println(B[i]);
                System.out.println();
        }
```

```
                do {
                        System.out.println("Enter the book number whose details you want to display:
");
                        x = in.nextInt();
                } while(x < 1 && x > n);
                B[x-1].show();


        }
}
```

Output:

:

```
PS C:\Users\Deepesh\desktop\java> java Book
Enter number of books to be created:
2
Book 1
Enter name of book:
Ascii
Enter name of author:
Jason
Enter price of book in Rs:
800
Enter number of pages in the book:
700

Book 2
Enter name of book:
Java
Enter name of author:
Tata
Enter price of book in Rs:
1200
Enter number of pages in the book:
1500

Book 1
Ascii, By Jason for Rs.800.0 and has 700 pages

Book 2
Java, By Tata for Rs.1200.0 and has 1500 pages

Enter the book number whose details you want to display:
1
Name: Ascii
Author: Jason
Price: 800.0
Number of pages: 700
PS C:\Users\Deepesh\desktop\java>
```

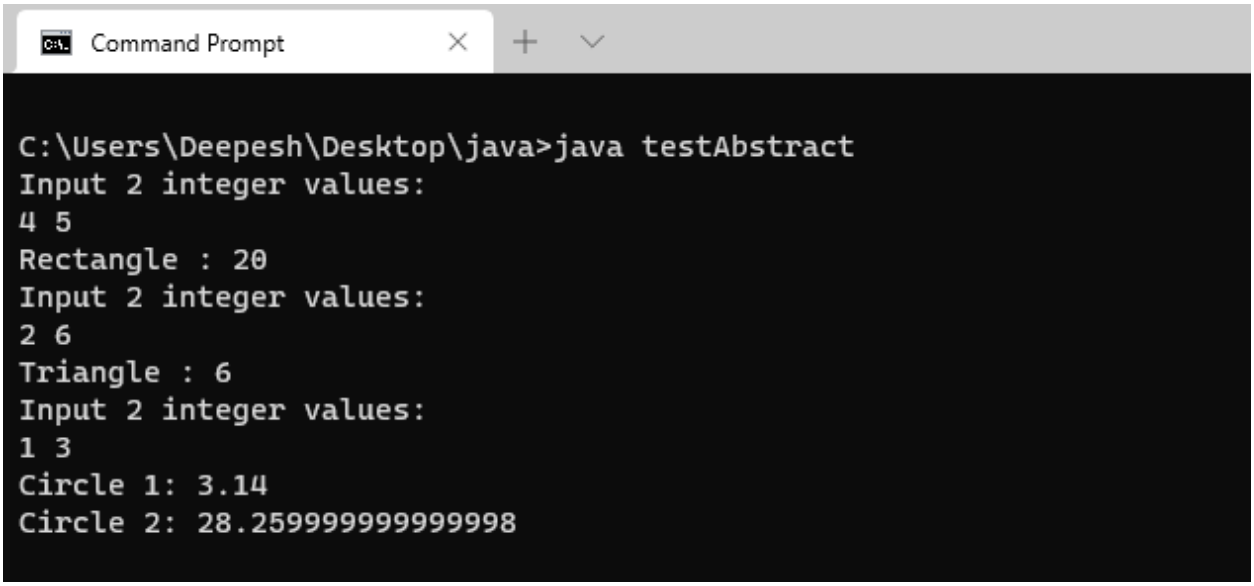
Java Lab Program 4

Code:

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

abstract class Shape {
	Scanner in = new Scanner(System.in);
	int a1, a2;
	Shape() {
		System.out.println("Input 2 integer values: ");
		a1 = in.nextInt();
		a2 = in.nextInt();
	}
	abstract void printArea();
}


class Rectangle extends Shape {
	void printArea() {
		System.out.println("Rectangle : " + a1*a2);
	}
}


class Triangle extends Shape {
	void printArea() {
		System.out.println("Triangle : " + (a1*a2)/2);
```

```
        }
}


class Circle extends Shape {
        void printArea() {
                System.out.println("Circle 1: " + (3.14 * a1 * a1));
                System.out.println("Circle 2: " + (3.14 * a2 * a2));
        }
}


class testAbstract {
        public static void main(String[] args) {
                Shape s;

                s = new Rectangle();
                s.printArea();

                s = new Triangle();
                s.printArea();

                s = new Circle();
                s.printArea();
        }
}
```

Output:


Command Prompt
C:\Users\Deepesh\Desktop\java>java testAbstract
Input 2 integer values:
4 5
Rectangle : 20
Input 2 integer values:
2 6
Triangle : 6
Input 2 integer values:
1 3
Circle 1: 3.14
Circle 2: 28.259999999999998

Java Lab Program 5

Code:

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

class Account {

   String name, abc;
   int accNo;
   char accType;
   double bal = 0;
   double deposit;
   Scanner in = new Scanner(System.in);

   void input_data() {

      System.out.println("Enter your account type (S/C):");
      abc = in.nextLine();
      accType = abc.charAt(0);
   }

   void deposit() {

      System.out.println("Enter an amount to deposit: ");
      deposit = in.nextDouble();

      bal += deposit;
```

```
    System.out.println("Balance has been updated. ");
}

void view_balance() {

    System.out.println("Balance = " + bal);
}

public static void main(String[] args) {

    Scanner s = new Scanner(System.in);
    int x;
    Account a1 = new Account();
    a1.input_data();

    if (a1.accType == 'C' || a1.accType == 'c') {

        Current a2 = new Current();

        do {
            System.out.println("WELCOME TO YOUR CURRENT ACCOUNT");
            System.out.println("1. Deposit ");
            System.out.println("2. Check Balance ");
            System.out.println("3. Issue Cheque ");
            System.out.println("4. Exit");
            System.out.println("Enter your choice: ");
            x = s.nextInt();

            switch (x) {
```

```
            case 1:
               a2.deposit();
               break;
            case 2:
               a2.check_balance();
               break;
            case 3:
               a2.issue_cheque();
               break;
            case 4:
               System.exit(0);
               break;
            default:
               System.out.println("ERROR. INVALID CHOICE.");
         }

      } while (x <= 4 && x >= 1);
   } else if (a1.accType == 'S' || a1.accType == 's') {

      Savings a3 = new Savings();

      do {
         System.out.println("WELCOME TO YOUR SAVINGS ACCOUNT");
         System.out.println("1. Deposit");
         System.out.println("2. View Balance");
         System.out.println("3. Withdraw ");
         System.out.println("4. Calculate compound interest ");
         System.out.println("5. Exit ");
         System.out.println("Enter your choice: ");
```

```
            x = s.nextInt();

            switch (x) {
               case 1:
                  a3.deposit();
                  break;
               case 2:
                  a3.view_balance();
                  break;
               case 3:
                  a3.withdraw_balance();
                  break;
               case 4:
                  a3.compute_CI();
                  break;
               case 5:
                  System.exit(0);
                  break;
               default:
                  System.out.println("ERROR. INVALID CHOICE.");
            }

         } while (x <= 5 && x >= 1);
      } else
         System.out.println("INVALID ACCOUNT TYPE");
   }
}

class Current extends Account {
```

```
Current() {

   System.out.println("Enter your name: ");
   name = in.nextLine();

   System.out.println("Enter your account number: ");
   accNo = in.nextInt();

   deposit();
}

double chq_amount;

void issue_cheque() {

   System.out.println("Enter amount for which cheque is to be issued.");
   chq_amount = in.nextDouble();
   if (chq_amount > bal) {
      System.out.println("ERROR! Insufficient balance in account.");
   } else {
      bal -= chq_amount;
      System.out.println("Cheque has been issued SUCCESSFULLY");
   }
}

void check_balance() {

   if (bal < 1000) {
```

```
            System.out.println("Current available balance is lesser than minimum required balance.");
            bal -= 100;
            System.out.println("Service charge of Rs.100 has been deducted from your balance.");
        }
        view_balance();
    }
}

class Savings extends Account {

    double CI, withdrawal_ammount, time;

    Savings() {

        System.out.println("Enter your name: ");
        name = in.nextLine();

        System.out.println("Enter your account number: ");
        accNo = in.nextInt();

        deposit();
    }

    void compute_CI() {

        System.out.println("Enter time period in years: ");
        time = in.nextInt();
        CI = bal * Math.pow(1 + (0.08 / 12), 12 * time) - bal;
```

```
        System.out.println("CI = " + CI);
        bal += CI;
        System.out.println("CI has been deposited");
    }

    void withdraw_balance() {

        System.out.println("Enter the amount you want to withdraw: ");
        withdrawal_ammount = in.nextDouble();

        if (withdrawal_ammount > bal) {
            System.out.println("ERROR! THE ENTERED AMOUNT IS GREATER THAN THE AVAILABLE BALANCE...");
        } else {
            bal -= withdrawal_ammount;
            System.out.println("AMOUNT HAS SUCCESSFULLY BEEN WITHDRAWN!");
        }
    }

}
```

Output:

```
PS C:\Users\Deepesh\desktop\java> java Account
Enter your account type (S/C):
S
Enter your name:
Das
Enter your account number:
5151
Enter an amount to deposit:
8000
Balance has been updated.
WELCOME TO YOUR SAVINGS ACCOUNT
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
4
Enter time period in years:
5
CI = 3918.765666412841
CI has been deposited
WELCOME TO YOUR SAVINGS ACCOUNT
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
2
Balance = 11918.76566641284
WELCOME TO YOUR SAVINGS ACCOUNT
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
```

Java Lab Program 6

Code:

Personal Class:

```
package CIE;
import java.util.*;

public class personal {
   public String name;
   public int sem;
   public String usn;

   public void read() {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter the name");
      name = sc.next();
      System.out.println("Enter the semester");
      sem = sc.nextInt();
      System.out.println("Enter the USN");
      usn = sc.next();
   }

   public void display() {
      System.out.println("Student details: ");
      System.out.println("Name: " + name + "\nUSN: " + usn + "\nSem: " + sem);
   }
```

```
}
```

Internal Class:

```
package CIE;
import java.util.*;
public class internals extends personal
{
	public double cie[];

	public void accept()
	{
		cie= new double[5];
		Scanner sc = new Scanner(System.in);
		for(int i=0;i<5;i++)
		{
			System.out.println("CIE mark for course "+(i+1)+" : ");
			cie[i]= sc.nextDouble();
		}
	}
}
```

External Class:

```
package SEE;
import java.util.*;
```

```
import CIE.*;
public class externals extends personal
{
	public double see[];

	public void get()
	{
		see= new double[5];
		Scanner sc = new Scanner(System.in);
		for(int i=0;i<5;i++)
		{
			System.out.println("SEE mark for course "+(i+1)+" : ");
			see[i]= sc.nextDouble();
		}
	}
}
```

Main Class:

```
import CIE.*;
import SEE.*;
import java.util.*;

class Main {
   public static void main(String args[]) {
      Scanner sx = new Scanner(System.in);
      System.out.println("Enter the number of students");
      int n = sx.nextInt();
```

```
        CIE.internals in[] = new CIE.internals[n];
        SEE.externals en[] = new SEE.externals[n];
        int i, j;
        for (i = 0; i < n; i++) {
            System.out.println("Student " + (i + 1));
            in[i] = new CIE.internals();
            en[i] = new SEE.externals();
            in[i].read();

            System.out.println("CIE MARKS:");
            in[i].accept();
            System.out.println("SEE MARKS:");
            en[i].get();
            System.out.println();
            in[i].display();
            for (j = 0; j < 5; j++)

                System.out.println("Total Marks for course " + (j + 1) + ": " + (in[i].cie[j] + (en[i].see[j] / 2)));
        }
    }
}
```

Output:

```
Enter the number of students
2
Student 1
Enter the name
Ram
Enter the semester
3
Enter the USN
745
CIE MARKS:
CIE mark for course 1 :
45
CIE mark for course 2 :
55
CIE mark for course 3 :
40
CIE mark for course 4 :
35
CIE mark for course 5 :
47
SEE MARKS:
SEE mark for course 1 :
60
SEE mark for course 2 :
70
SEE mark for course 3 :
50
SEE mark for course 4 :
40
SEE mark for course 5 :
80

Student details:
```

```
Enter the USN
745
CIE MARKS:
CIE mark for course 1 :
40
CIE mark for course 2 :
35
CIE mark for course 3 :
25
CIE mark for course 4 :
35
CIE mark for course 5 :
46
SEE MARKS:
SEE mark for course 1 :
80
SEE mark for course 2 :
70
SEE mark for course 3 :
60
SEE mark for course 4 :
65
SEE mark for course 5 :
55

Student details:
Name: Bob
USN: 745
Sem: 3
Total Marks for course 1: 80.0
Total Marks for course 2: 70.0
Total Marks for course 3: 55.0
Total Marks for course 4: 67.5
Total Marks for course 5: 73.5
```

Java Lab Program 7

Code:

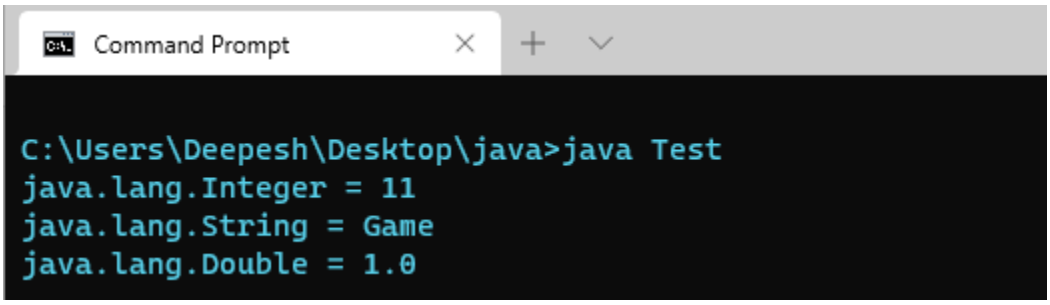
Java Lab Program

Lab Program 7:

Code:

```
class Test {

   static <T> void genericDisplay(T element) {
      System.out.println(element.getClass().getName() + " = " + element);
   }

   public static void main(String[] args) {
      // Integer argument
      genericDisplay(11);

      // String argument
      genericDisplay("Game");

      // double argument
      genericDisplay(1.0);
   }
}
```

Output:


Command Prompt
C:\Users\Deepesh\Desktop\java>java Test
java.lang.Integer = 11
java.lang.String = Game
java.lang.Double = 1.0

Java Lab Program 8

Code:

```
import java.util.Scanner;
class fatherAgeException extends Exception
{
   public String toString()
   {
      return("Wrong Age!! Father's age is less than 0");
   }
}

class sonAgeException extends Exception
{
   int a, b;
   sonAgeException (int sage, int fage)
   {
      a = sage;
      b = fage;
   }
   public String toString()
   {
      if(a==b)
        return("Wrong Age!! Son's age is equal to father's age");
     if(a<0)
        return("Wrong Age!! Son's age is less than 0");
     else
        return("Wrong Age!! Son's age is more than father's age");
```

```
    }
}

class Father
{
    public int agel;
    Scanner scan = new Scanner(System.in);
    int age1;
    Father()
    {
        System.out.print("Enter father's age: ");
        age1 = scan.nextInt();
   }
    void ex1() throws fatherAgeException
    {
        if (age1 < 0)
          throw new fatherAgeException();
    }
}

class Son extends Father
{
    public int age2;
    Son()
    {
        System.out.print("Enter son's age: ");
        age2 = scan.nextInt();
    }
    void ex2() throws sonAgeException
```

```
    {
        if(age2 < 0 || age2>=age1)
        throw new sonAgeException (age2, age1);
    }
}

class Main
{
    public static void main(String [] args){
        Son s = new Son();{
        try{
            s.ex1();
        }
        catch(fatherAgeException e)
        {
            System.out.println(e);
        }
        try
        {
            s.ex2();
        }
        catch (sonAgeException e)
        {
        System.out.println(e);
        }
        }
    }
}
```

Output:

```
C:\Users\Deepesh\Desktop\java\java>javac main.java

C:\Users\Deepesh\Desktop\java\java>java Main
Enter father's age: 4
Enter son's age: 50
Wrong Age!! Son's age is more than father's age

C:\Users\Deepesh\Desktop\java\java>java Main
Enter father's age: 0
Enter son's age: 4
Wrong Age!! Son's age is more than father's age

C:\Users\Deepesh\Desktop\java\java>java Main
Enter father's age: -1
Enter son's age: 5
Wrong Age!! Father's age is less than 0
Wrong Age!! Son's age is more than father's age
```

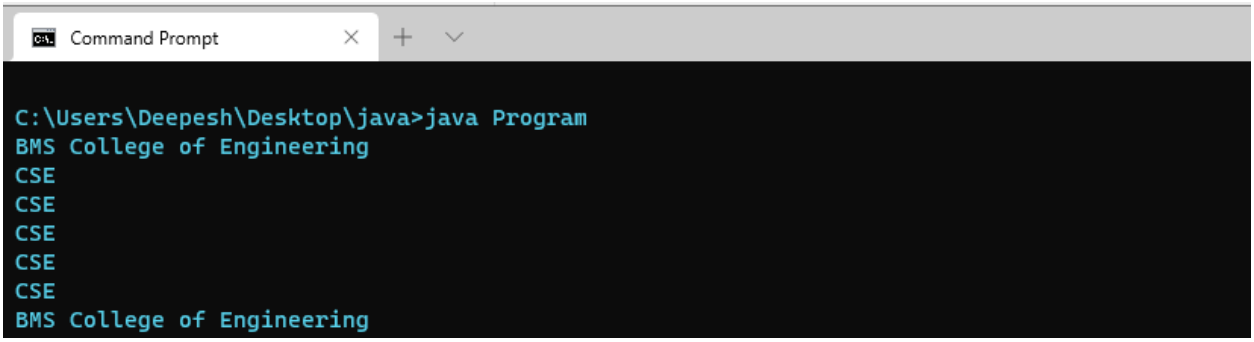
Java Lab Program 9

Code:

```
import java.util.*;

class RunnableDemo implements Runnable {
   private Thread t;
   private String threadName;
   private int Stime;

   RunnableDemo( String name,int Stime) {
      this.threadName = name;
      this.Stime = Stime;
   }

   public void run() {
      try {
         for(int i = 4; i > 0; i--) {
            System.out.println(threadName);
            Thread.sleep(Stime);
         }
      } catch (InterruptedException e) {
         System.out.println(threadName + " interrupted.");
      }
      System.out.println(threadName);
   }

   public void start () {
      if (t == null) {
```

```
        t = new Thread (this, threadName);
        t.start ();
      }
    }
}

public class Program {

  public static void main(String args[]) {
    RunnableDemo R1 = new RunnableDemo("BMS College of Engineering",10000);
    R1.start();

    RunnableDemo R2 = new RunnableDemo("CSE",2000);
    R2.start();
  }
}
```

Output:



Java Lab Program 10

Code:

```
import java.awt.*;
import java.awt.event.*;
class DivisionInteger extends Frame implements ActionListener{
   TextField num1TextField;
   TextField num2TextField;
   Button calculate;
   int a,b;
   float result;
   String msg="Enter the numbers";
   public DivisionInteger(){

      setLayout(new FlowLayout());

      calculate=new Button("Calculate");
      num1TextField=new TextField(5);
      Label num1Label=new Label("Number 1",Label.RIGHT);
      num2TextField=new TextField(5);
      Label num2Label=new Label("Number 2",Label.RIGHT);

      add(num1Label);
      add(num1TextField);
      add(num2Label);
      add(num2TextField);
      add(calculate);
      num1TextField.addActionListener(this);
      num2TextField.addActionListener(this);
```

```
    calculate.addActionListener(this);


    addWindowListener(new MyWindowAdapter());
}
public void actionPerformed(ActionEvent ae){
    try{
        result=divideNumbers();
        msg=("The result is "+result);
        repaint();
    }catch(NumberFormatException e){
        msg="Number is not Integer."+e;
        repaint();
    }catch(ArithmeticException e){
        msg="Divide By zero not Allowed."+e;
        repaint();
    }
}
public float divideNumbers(){
    a=Integer.parseInt(num1TextField.getText());
    b=Integer.parseInt(num2TextField.getText());
    if(b==0){
        throw new ArithmeticException();
    }
    return (float)a/b;
}
public void paint(Graphics g){
    g.drawString(msg,50,100);
}
public static void main(String args[]){
```

```
        DivisionInteger div=new DivisionInteger();
        div.setSize(new Dimension(500,500));
        div.setTitle("Division Calculater");
        div.setVisible(true);
    }
}
class MyWindowAdapter extends WindowAdapter{
    public void windowClosing(WindowEvent event){
        System.exit(0);
    }
}
```

Output: